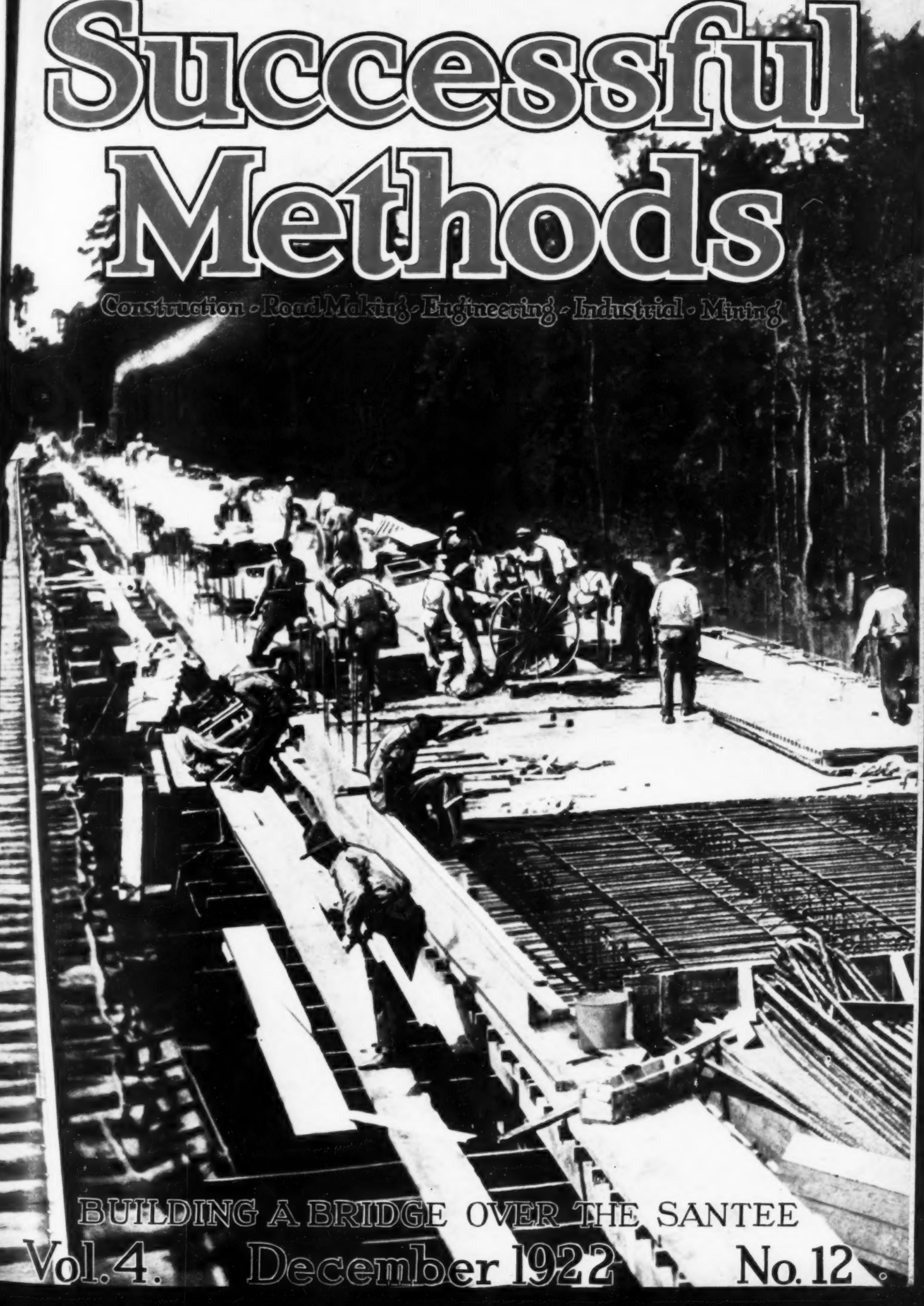
Successful Methods

Construction - Road Making - Engineering - Industrial - Mining



BUILDING A BRIDGE OVER THE SANTEE

Vol. 4. December 1922 No. 12

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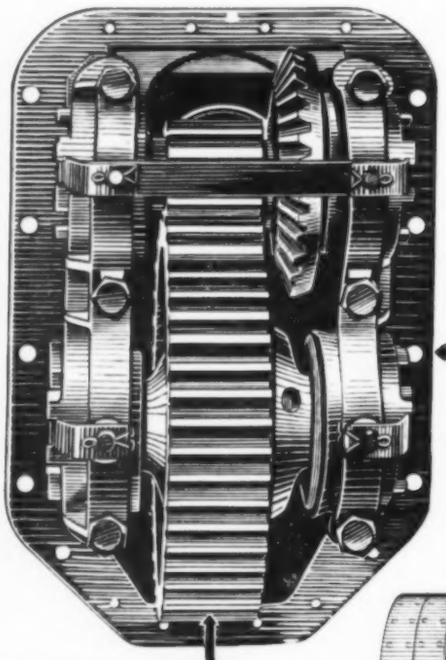

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Successful Methods

A Magazine of Construction Service

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Vol. IV. DECEMBER, 1922 No. 12

The Common Labor Shortage

THREE months ago attention was called in these columns to the common labor shortage which had begun to be felt even then. Since that time the situation has become serious. There is no need to speak here of what we are up against now. The outlook for the next few months, however, is worthy of attention.

Go anywhere you will in the country and you will find the supply of common labor is falling behind the demand. In the corn belt the farmers are short of help. In the industrial sections mills and factories cannot fill orders, because they cannot get men.

Week by week the situation gets worse. Winter will slow up or stop a lot of outdoor work. This will tend to relieve the situation for a time. Next spring when outdoor work opens up nobody knows just what will happen.

Meanwhile most men in charge of construction go calmly on planning to handle their work just as they have in the past. They will not consider new methods or more equipment unless they can make a big saving over the cost of methods that require more men. But next year it apparently will not be just a comparison of costs; it will be a case of getting labor.

Concerns which look ahead are preparing to meet the situation by using methods and equipment that will save men. What are you going to do?

The Road Show and Convention

EVERY highway builder in this country should make his plans now to attend the Road Show and Convention at Chicago in January. The arrangements for these two big events of the year in the highway industry already are practically complete. A summary of them appears elsewhere in this issue. Little idea can be conveyed in such brief form, however, of the value of what may be seen and heard next month at Chicago. The Road Show and Convention both will far surpass any events of the kind ever held.

This statement sounds as though it came from the advance agent of a circus, but it is justified. So great an industrial exhibit and so unusual a convention are certain mainly because of the spirit of co-operation with which such a large number of strong men have entered into their jobs on the committees in charge of the arrangements. Special credit also is due especially to the many leaders in highway work from all parts of the country who have accepted assignments on the program.

The total of the applications for space in the Road Show was nearly twice the amount of space available. This is in spite of the fact that more space will be provided this year than ever before. Never in the past have the manufacturers planned their exhibits so far ahead as they have this year. This event by itself would justify any highway engineer or contractor the expense of a trip to Chicago.

The coming convention will mark the beginning of a new era in affairs of this sort. The program is to be devoted to subjects on which developments are occurring rapidly, and to those over which there is difference of opinion. The sessions will be handled by men who know the subjects and who have had experience in conducting large meetings. Several men of authority will be ready to enter into each of the discussions. These arrangements assure a program that will bring out much information that is new to most of the industry.

Make your plans now to go to Chicago. You may see and hear there in four days more of up-to-date highway methods and equipment than you could in a month of traveling.

The Carry Over

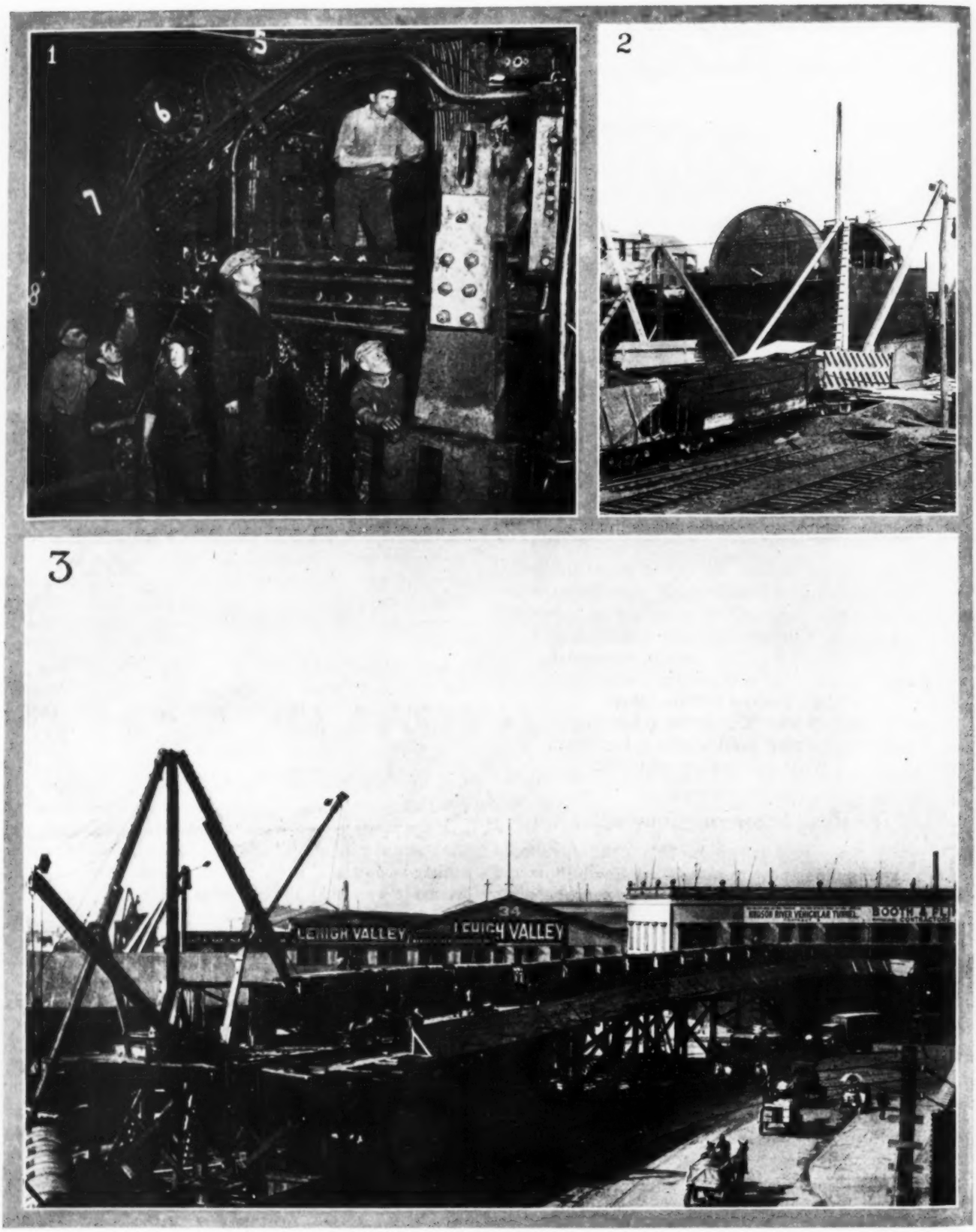
SOME comments that we made last September on the amount of construction work let this year that would not be finished this season were questioned rather seriously. Developments since then show that we made a mistake the other way. The amount of 1922 jobs that will be carried over into 1923 far exceeds our estimate of three months ago.

Elsewhere in this issue are comments on this subject from the highway engineers of twenty-two States. Similar data from twenty-four State highway engineers were printed in our November issue. Look over these figures. Then stop to consider the fact that records for new building construction are going by the boards regularly.

Unless there is a world collapse of some kind, next year will be a corker for the construction man who is ready to do business under the conditions—which means methods and equipment selected to meet these conditions.

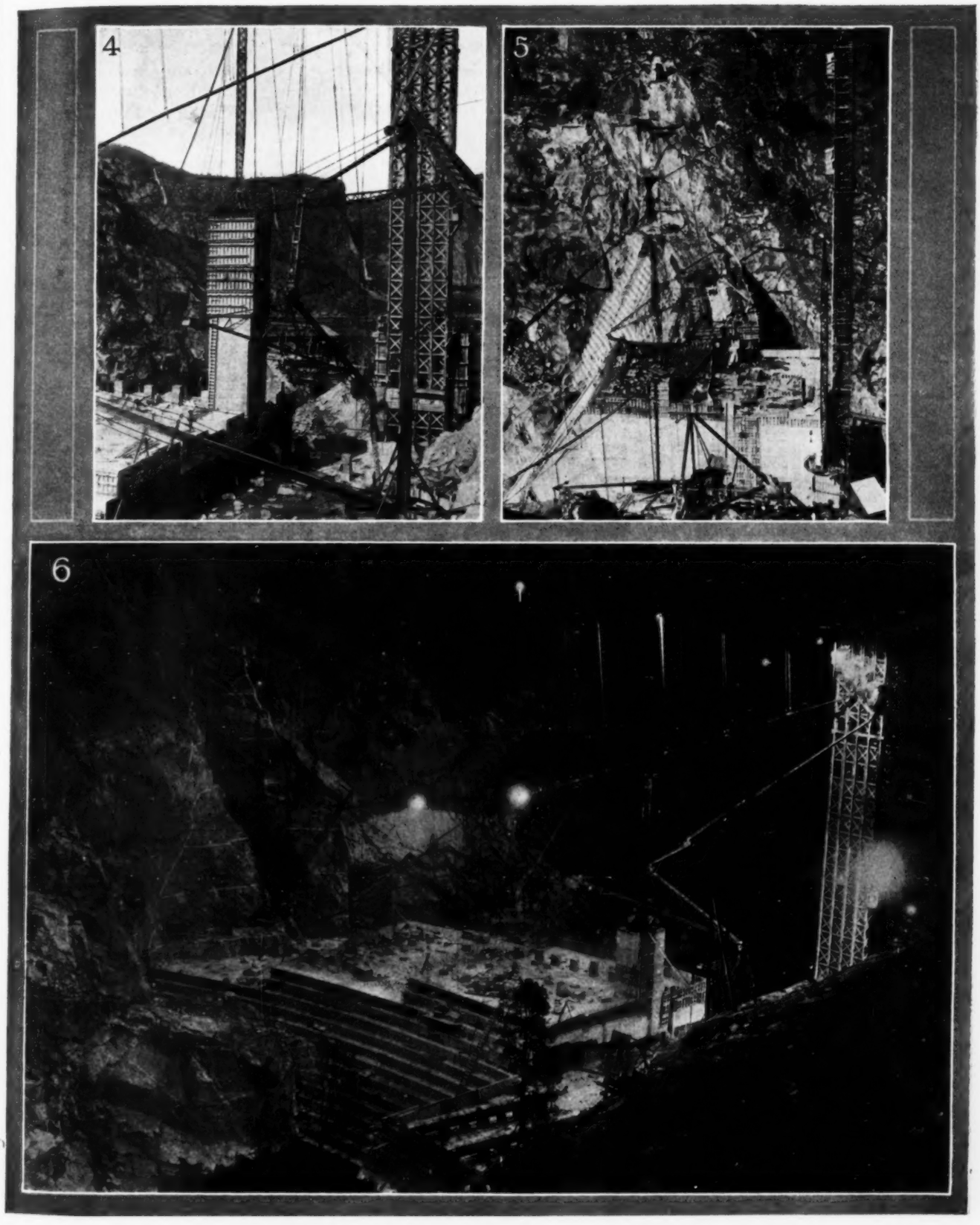
Successful Methods goes each month to 40,000 men in the construction industry. There is no charge for it.

Two Big Construction Jobs



1—The actual boring of the New York and New Jersey Vehicular Tunnel gets under way. This photograph shows a section of the big shield which is doing the work. © *Keystone Views.*
2—One of the caissons for the tunnel being built in the Jersey City yards. © *P & A Photos.*
3—At the Manhattan end of the tunnel. This photograph shows the long sheds, through which the workmen pass after leaving the tube. © *Keystone Views.*

With the Continent Between



4—Looking upstream from the south side of the Hetch Hetchy Dam during the early stages of the construction last spring.
5—View of the dam from high up on the mountainside. This shows the progress made during the summer months since the first photograph was taken. © *International.*
6—A night scene at the dam showing the excellent method of illumination.

THE 1923 HIGHWAY PROGRAM

(Continued from November Issue)

Remaining States Furnish Statistics on Carry Over and New Work

LAST month SUCCESSFUL METHODS printed the replies from twenty-four State highway departments showing the amount of road work which will be carried over into 1923 and also the new work planned for next year. The replies from the remainder of the States with two exceptions are printed below. Every contractor reader of SUCCESSFUL METHODS, by referring to the two issues in which these statistics appear may find out for himself just what work is being planned in his own territory.

ALABAMA

W. S. KELLER, STATE HIGHWAY ENGINEER

"THE amount of road work under construction to be carried over into 1923 totals 325 miles costing $5,261,911.

"New work for which contracts will be let within the next six months amounts to 282 miles which will be built at an estimated cost of $4,250,000."

ARIZONA

THOS. MADDOCK, STATE HIGHWAY ENGINEER

"THE working season in Arizona is 52 weeks per year, so work is not carried over in the sense that it is in other States. The program now outlined calls for 500 miles within the next two years, most of which will be grading with some paving. Provided Federal aid continues and the State laws are not changed, the greater part of this program should be completed in 1923."

ARKANSAS

R. C. LIMERICK, STATE HIGHWAY ENGINEER

"OUR summary of work done, work to be carried over and prospect for work next year is not made until about the 15th of December. Approximate estimates are given below:

Type	Miles Carried Over to 1923	Proposed New Construction, 1923
Gravel	160	320
Macadam	20	0
Penetration macadam	85	25
Bituminous concrete	65	15
Concrete	40	50

CALIFORNIA

A. B. FLETCHER, STATE HIGHWAY ENGINEER

CALIFORNIA reports that road work amounting to approximately $6,000,000 will be carried over into 1923, and that additional work outlined for 1923 will cost about $10,000,000.

LEWISTON HILL, EIGHT MILES LONG, ON THE NORTH AND SOUTH HIGHWAY IN NEZ PERCE, IDAHO. CRUSHED ROCK SURFACE

ONE OF SOUTH DAKOTA'S ROADS. THE NEEDLES HIGHWAY IN CUSTER STATE PARK

GEORGIA

W. R. Neel, State Highway Engineer

ON January 1, Georgia will have approximately 700 miles of road under construction. Because of the fact that Georgia is so far South, weather conditions are not expected to interfere with the work. Next year the State probably will build about 500 additional miles of highway and several important drainage structures.

IDAHO

D. P. Olson, Director of Highways

"VIRTUALLY all our program for this year will have been completed by the end of December with the exception of 96 miles, which will be carried over into next year's program, most of which is of the crushed rock surfaced type. We have, likewise, three projects totaling 33 miles which have not been let this year and will necessarily be carried over for early spring letting.

"It is rather difficult to outline our program for 1923, owing to certain financial appropriations which must be met by the incoming Legislature. We, however, contemplate at the present time having a tentative program of 200 miles, most of which will be of the crushed rock, or gravel type of surfacing, with very little, if any, of the so-called hard surfacing."

IOWA

Fred. R. White, Chief Engineer

"WE expect to carry over into next season approximately the following amount of work which is now under contract: Grading, 500 miles; graveling, 300 miles; paving, 100 miles."

LOUISIANA

J. M. Fourmy, State Highway Engineer

"IN Louisiana there have been put under construction during the present calendar year about 425 miles of highway. These, together with construction work carried over from 1921, total about 710 miles under construction at this writing, about 600 miles of which will be carried over into 1923. By "carried over" is meant that construction work will not be finished by January 1, 1923. Weather conditions are such in this State that there is little slackening in road building operations during the winter and spring months

"It is estimated that 500 miles of highway, exclusive of that carried over from 1922, will be put under construction during 1923. A large percentage, probably over 90 per cent, of the above highways will be surfaced with gravel and shells. It should, of course, be understood that the above applies only to roads belonging to the State highway system, over which class of roads this Commission has jurisdiction. In addition, the several parishes of the State will, no doubt, place a large mileage under construction."

MAINE

Paul D. Sargent, Chief Engineer

"THE following is a very close statement of work which will go over to 1923 for completion: Five sections of reinforced concrete pavement upon which the estimated cost of completion is $303,000; eleven sections of gravel road, estimated cost of completion $262,000; three sections of bituminous macadam, estimated cost of completion $68,000; a total of nineteen projects, at an estimated cost of completion of $633,000. This represents about 20 per cent of the State highway program for the year 1922."

MARYLAND

J. N. Mackall, Chief Engineer

"THE road work in Maryland which will be carried over into 1923 totals 163.32 miles divided as follows: concrete, 93.55 miles; gravel, 43.57 miles; asphalt, 4.23 miles; macadam reconstruction, 13.63 miles; asphalt resurfacing roads previously constructed, 1.89 miles; concrete shoulders on road previously constructed, 2 miles; grading only, 4.45 miles.

"The amount of new work to be undertaken during 1923 has not yet been accurately determined but will be approximately 150 miles."

MINNESOTA

John H. Muller, Chief Engineer

"ALL the paving under contract for the season of 1922 has been completed. We have, however, 157 miles of grading which will be carried over into 1923. Our program for 1923 construction depends upon action taken by the legislation this winter. Should the present law with reference to funds remain practically as it now stands, our program will consist of approximately the following: Paving, 70 miles; grading, 300 miles; gravel surfacing, 300 miles."

MISSOURI

B. H. Piepmeier, Chief Engineer

"AT this time there are 1323 miles of highway under construction, the contract price, plus engineering and contingencies, totaling $13,744,838. Of this amount of work it seems probable that about 400 miles will be carried over into the 1923 season. This mileage includes: 197 miles graded earth; 158 miles gravel pavement; 14 miles bituminous macadam; 29 miles concrete pavement; 2 miles vitrified brick pavement.

"As nearly as can be determined, contracts will be let during 1923 for about $15,000,000, covering approximately 750 miles of the various types of highway construction."

MONTANA

John N. Edy, Chief Engineer

"WE will probably carry into 1923 approximately $450,000 value of uncompleted work from 1922 contracts. This will be approximately 72 miles of gravel road and 23 miles of graded road. We contemplate letting to contract in 1923 twenty-seven projects, 260 miles of which will be gravel surfaced, and 19 miles of which will be unsurfaced, estimated to cost $2,400,000. The present season's work is now closing down on account of unfavorable weather."

NEBRASKA

George E. Johnson, Secretary

"WE will carry over about 50 miles of work costing approximately $250,000. This work consists of grading and culverts.

"We are planning on 400 miles for next year—grading and culvert work, costing approximately $2,000,000; fifty miles of gravel roads to cost $200,000."

NEW HAMPSHIRE

Frederick E. Everett, Commissioner and State Engineer

"UNCOMPLETED road work this year, that is to be carried over into the next season, will total about six miles. It is impossible to determine, at this time, the program for next year, as much depends upon the action of the Legislature, which meets in January."

NEW YORK

Herbert S. Sisson, Commissioner

"WE expect to carry over approximately 425 miles of pavement to be laid. In addition to that, it is expected that during the coming winter contracts amounting to 500 miles of additional new construction will be let. The mileage of reconstruction cannot be determined at this time, because it will depend upon the amounts of appropriations made by next year's Legislature. During the past year we let reconstruction contracts covering approximately 200 miles, and I would be much surprised if the mileage of reconstruction next year is not considerably greater than this year."

NORTH CAROLINA

Charles M. Upham, State Highway Engineer

"SINCE July 1st we have thrown 2000 miles of construction into the hopper. While we intended to complete more than two-thirds of this during 1922, I am afraid we will not complete more than 800 miles. This means that we will carry over in all classes of construction more than 1200 miles of pavement, and also that we will put approximately 800 to 1000 of pavement under contract during 1923."

OKLAHOMA

Max L. Cunningham, State Engineer

"CONSTRUCTION work in Oklahoma is not limited by the seasons. We are letting contracts in almost every month of the year. We are constructing at about the rate of 200 miles of hard surface road per year and the prospects are that this will be increased in the future."

RHODE ISLAND

I. W. Patterson, Chief Engineer

"WE estimate that there will be carried over into next season contracts involving the construction of 3.9 miles of bituminous concrete, 1.8 miles of concrete and 2.5 miles of alphaltic macadam. Exclusive of the work carried over to next season, we expect to build next year 12 miles of asphaltic macadam, 19 miles of concrete, 1.4 miles of sheet asphalt and 5.5 miles of bituminous concrete."

SOUTH DAKOTA

F. D. Hudgins, State Highway Engineer

"GRADING work under contract, involving approximately 250 miles of highways on twenty-six projects, will be carried over into 1923. No grading work is in progress at present on account of snow, but should the weather permit between now and January 1st, some of this mileage will be completed.

"Probably 50 miles of gravel surfacing on twenty-one projects, out of 200 miles now under contract but not completed, will be carried over. We expect to advertise about 200 miles of grading and small structure work between now and April 1st."

WEST VIRGINIA

C. P. Fortney, Chairman State Road Commission

"OF the 149 miles of grading contracts and 200 miles of grading and paving contracts under construction this season, approximately two-thirds of the grading work will be completed before the end of the year. Owing to the railroad and coal strikes a very small amount of paving work has been done and fully two-thirds will be carried over until spring.

"Contracts will be awarded in November and December, 1922, covering the balance of funds already made available for expenditure in 1923. A large part of such construction will be for grading preparatory to paving. It is impossible to give an estimate of the 1923 program, as the Legislature meets in January, at which time additional funds will undoubtedly be appropriated for the ensuing two-year period."

WISCONSIN

A. R. Hirst, State Highway Engineer

"ON concrete paving work, which is practically our entire program of paving, we expect to carry over about 100 miles of paving out of a program of 455 miles. We will carry over little, if any, of other types of work—possibly about 40 or 50 miles of graveling.

"Our next year's program will be quite similar to the one of this year, provided we get the proper legislation this winter. We will probably have about 350 to 400 miles of new concrete paving and from 1200 to 1500 miles of graveling work, which is about the amount we had this year."

ONLY two States were unable to furnish information at this time in regard to the amount of their carry-over and programs of new work for next year. The two absentees are Virginia and Connecticut. Down in Virginia Commissioner H. G. Shirley is up to his ears in work incident to the passing of a bond issue on which the entire road program will depend, and in Connecticut certain unavoidable conditions made it impossible for Commssioner C. J. Bennett, who is well known wherever highway work is discussed, to supply the information at this time.

SOUTH CAROLINA BRIDGES THE SANTEE

Four-Mile Causeway Across Swamp Which Borders River Is Part of Project. All Structures Except Main Span Are of Concrete

ONE of the great rivers of the South is the Santee. Formed by the confluence, a few miles below Columbia, of the Congaree and the Wateree, it reaches the sea near the center of South Carolina's coast line between Charleston and Georgetown. With its various tributaries it drains most of the State and a part of North Carolina, about 15,000 sq. mi. altogether. Bordering the river on each side are thickly timbered swamps 4 or more miles wide, separating an important section of the State and preventing free travel between the two portions.

There is a highway bridge over the Congaree at Columbia, and over the Wateree there is one at Camden, and one almost completed between Columbia and Sumter, but there is no highway bridge across the Santee.

To remedy this situation, there is now under construction (begun June 21, 1921) a bridge over the Santee and a causeway across the swamp, near St. Stephens, a town about 65 mi. above the mouth of the river. At the site the main channel is about 330 ft. wide and the swamp is nearly 4 mi. wide. In order to reduce the maintenance charges to a minimum, all structures, except the main span, are of reinforced concrete. The bridge is to have an 18-ft. roadway and will be above the highest known water. As the Santee is a navigable stream, a 63-ft. draw span is provided. The main channel crossing has one 180-ft. steel through truss swing span and two 120-ft. steel through truss fixed spans on concrete piers.

A TYPICAL SECTION OF THE CAUSEWAY SHOWING CONCRETE BENTS IN PLACE AND TEMPORARY TRESTLE.

The approach trestles have a total length of about 6000 ft. There are 7 trestles, of lengths and positions such as to provide for the most effective discharge of the flood waters. These trestles alternate with earth embankments. The plans provided for two types of structure, one type having 24½-ft. concrete beam spans on concrete pile bents, the other, pedestal type, having 36½-ft. concrete beam spans on cast-in-place bents on timber piles. The latter, however, have been used to a small extent only.

There are 4 precast piles to the bent, the 2 outside piles being put up with a batter. These piles are cast on the nearest high ground in a yard which contains 70 forms. They are left in the forms one week and then allowed to season one month before driving. The trestles were designed for a live load of two 15-ton trucks with 25 per cent allowance for impact. The embankments are to be 23 ft. high, have a total length of 13,200 ft., and will require 800,000 cu. yd. of earth.

Material for the fills is being taken from borrow pits outside the swamp. Progress is being made on the fills on the Williamsburg side of the river, which require 70,000 cu. yd. The fills on the Berkeley side involve the excavation of 680,000 cu. yd. of material from a 48-acre borrow pit. Under energetic superintendence with standard gauge equipment this part of the work is proceeding rapidly, and the average of about 40,000 cu. yd. a month will probably be maintained to the end.

In all there are now 440,000 cu. yd. of earth fill in place; 4 river piers are completed and the draw span erected; 490 concrete piles have been driven and 760 concrete piles have been cast; and decks for 70 spans of trestle have been poured.

In order to protect the trestles from the heavy drift carried by the Santee in flood, a strip of land 225 ft. wide is provided on the upstream side of the right of way, on which the timber is to remain standing so long as protection of the trestles is necessary. Wooden railings are to be used on the embankments, on account of the risk of settlement causing crack-

ing of concrete railings. On the trestles a simple and pleasing form of concrete railing, widely used in the South, will be applied.

The State Highway Department and the Santee Bridge Commission let this important work in three contracts: the steel spans to the Atlantic Bridge Company, Roanoke, Va.; the substructure of those spans, the river piers, to the Simons-Mayrant Company, Charleston, S. C.; and the remainder of the project, the approaches to the three main spans, to the Rollin Construction Corporation, New York. Retaining the concrete work and the general supervision, directed by James Pinnell, superintendent, the Rollin Corporation sublet the earth work on the Berkeley County side to Cornell-Young Company of Macon, Ga., and Charlotte, N. C., and on the Williamsburg County side to P. O. Arrowsmith of Kingstree, S. C. The clearing of the right of way, 200 ft. wide, and the construction of a temporary trestle was sublet to Bryant LaBrace of Charleston, S. C.

BORROW PIT FROM WHICH MATERIAL FOR FILLS IS OBTAINED.

The level of the roadway is to be 3 ft. above the high-water mark of the 1916 flood. Some of the concrete has been laid under 28 ft. of water and concrete construction has been greatly delayed by high water since early in February.

For bringing in material the Rollin Corporation laid five miles of standard gage railroad from St. Stephens, on the Atlantic Coast Line, alongside a country highway to the edge of the swamp. J. L. Parker, Special Bridge Engineer, State Highway Department, is the designer and in charge of the construction. W. C. Roberts is the resident engineer, and J. W. Williams is the assistant.

The total cost will be about $850,000, and funds are provided by the Santee Bridge District, composed of the Counties of Charleston, Williamsburg and Berkeley, and (one half) by the Federal Government. Williamsburg is to pay $60,000, Berkeley $40,000 and Charleston the balance.

This work is one of the largest bridge projects in the Southern States. It will be an important link in the proposed Atlantic Coastal Highway, and will fill a long-felt want in South Carolina.

The South Carolina Highway Department under the direction of Chas. H. Moorefield, State Highway Engineer, is building several other important bridges. Two interstate bridges are being constructed over the Savannah River, one near Augusta and the other near Savannah, which cost respectively $250,000 and $600,000. A bridge over the Wateree River between Columbia and Sumter, which is now nearly finished, will cost about $150,000. Next year the State plans to build a bridge costing between seven and eight million dollars over the Ashley River near Charleston.

THE APPROACH AT THE NORTH END OF THE BRIDGE SHOWING METHODS OF CONSTRUCTION.

A DEMONSTRATION CONCRETE ROAD IN FRANCE:

American Methods and American Machines Used. Road Built in Two Strips

By L. A. Nutter

THE modern concrete road which has been developed in America during the last decade is almost unknown in Europe. Several experimental roads have been constructed but these have usually departed radically from the design and methods which American experience with concrete roads has proved desirable. Most of the criticism of concrete roads which is heard in Europe is based on roads constructed in the States prior to the war, when a rather lean mixture was employed, unwashed sand and gravel frequently used, and before the advent of the finishing machine.

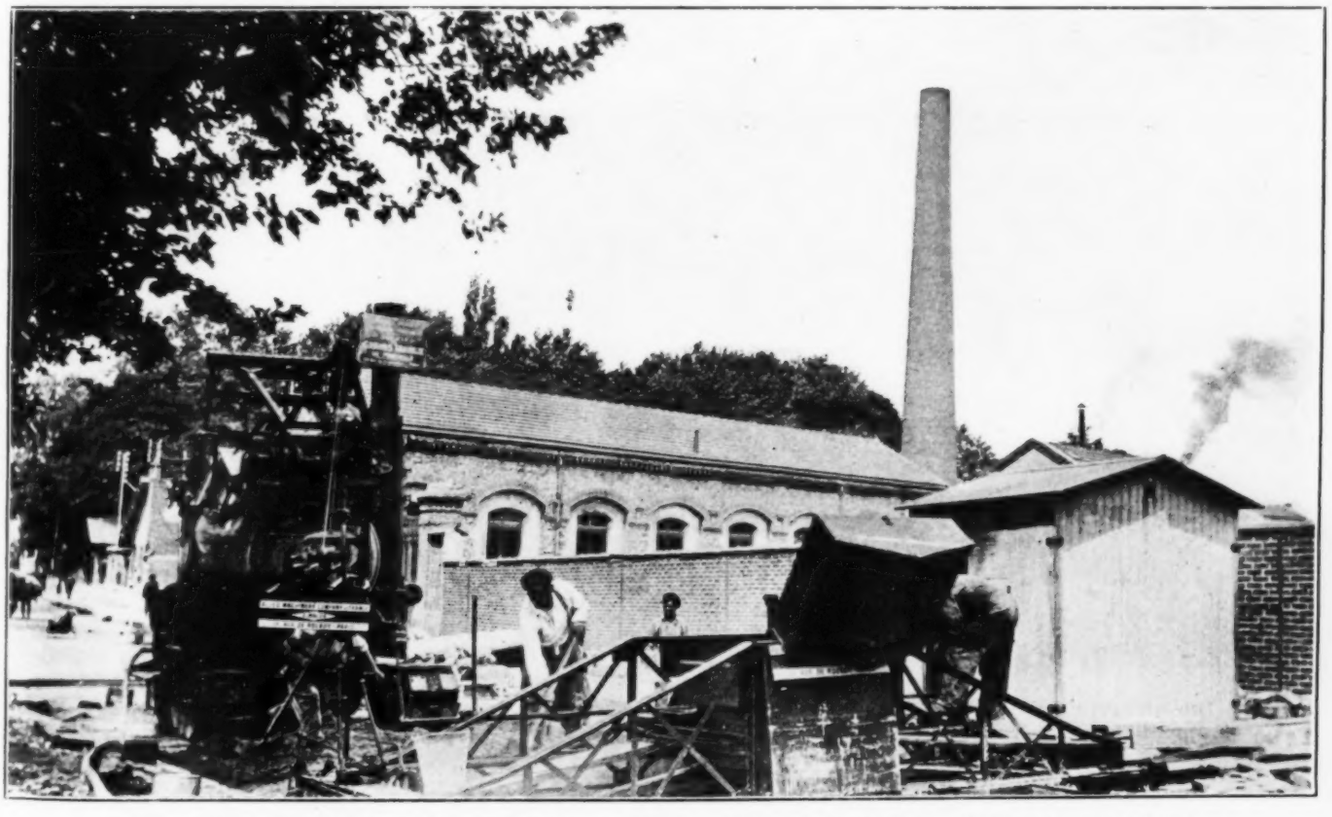
The Cement Manufacturers Association of France, co-operating with one of the large contracting companies in Paris, has undertaken an interesting and important propaganda for concrete roads, bringing the advantages of this type of road to the attention of the public as well as to contractors and engineers. A part of this advertising included the construction of an experimental, or rather "sample," concrete road, which was undertaken under the direction of the Engineer of the Department of the Seine. This road was constructed with a modern paver and a modern finishing machine, both made in the United States, and followed closely the latest American specifications for concrete roads.

The road which was selected for the demonstration is located along the banks of the Seine between the Saint Cloud bridge and the Sevres bridge, a distance of 1600 meters, or approximately a mile. The traffic would be classed as an average, both from the standpoint of the number of vehicles and of wheel loading. The results will undoubtedly determine the future of concrete roads in France. The road has a width of 9 meters, or about 29 ft. 6 in. This unusual width, together with the necessity of keeping one-half the road open for traffic at all times, necessitated the construction in two equal strips.

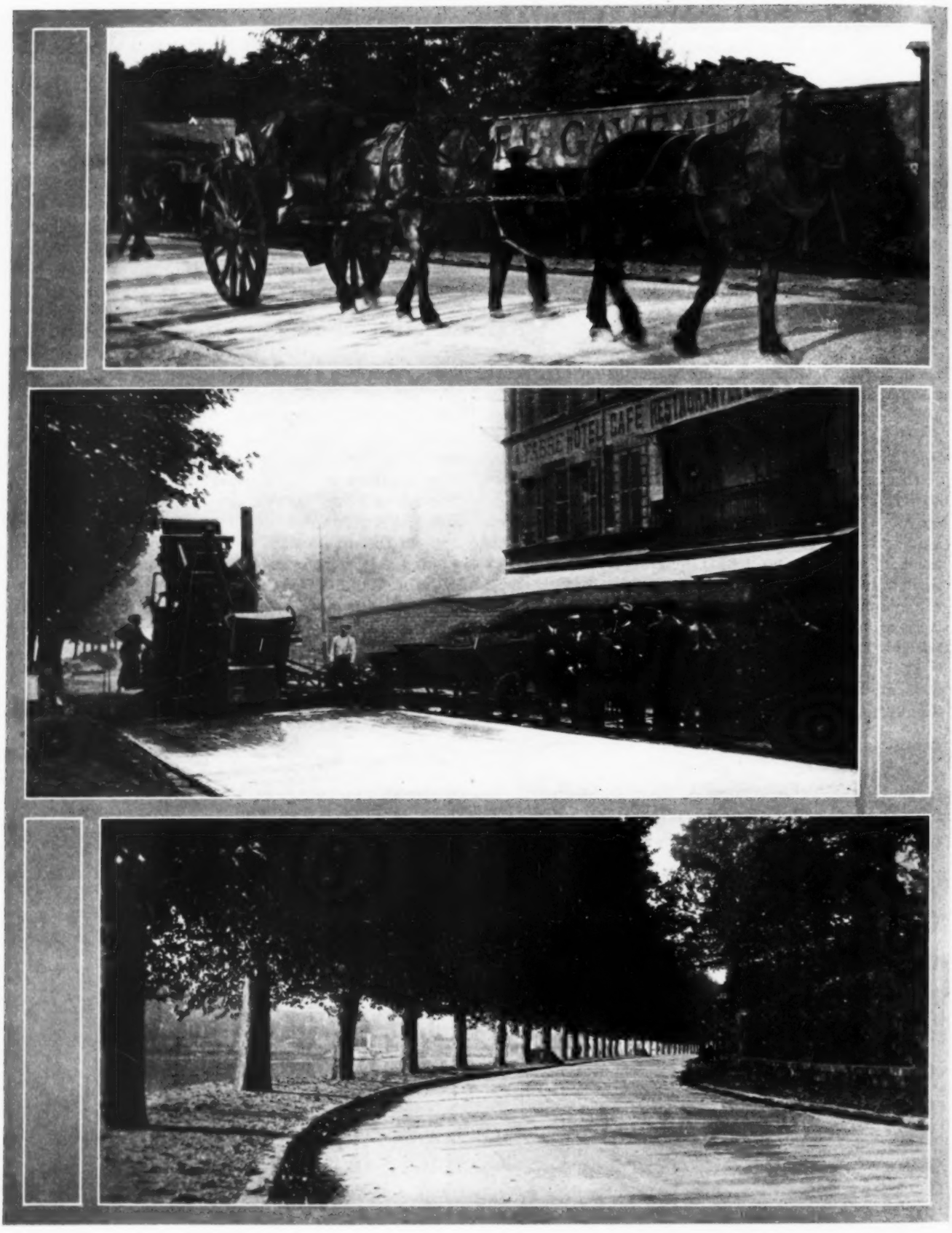
The original macadam surface was scarified and the excess material removed in order that the crown could be reduced to 1 in 70, as shown in the sketch. The granite curbing was taken up and reset and the granite block paving which had served as a gutter with the macadam road was removed. After scarifying, the subgrade was thoroughly rolled and wetted before concrete was laid.

A uniform section 6 in. thick was employed. Although this may be considered slightly under present-day practice, it was adopted after careful consideration of the subgrade which has been thoroughly compacted for centuries. This thickness undoubtedly will be found ample for requirements of European roads in all cases where the original roadbed serves as a base.

No expansion joints were employed, but each day's run was prevented from bonding with the previous day's work in order to present a lateral plane of weakness. At the end of 60 days' service the only



THE MIXER THAT LAID 400 METERS IN 8 HOURS. NOTE THE SMALL NUMBER OF WORKMEN.



At the Top—Hauling building sand over the experimental concrete road. This is the "standard" method in France, and the anti-slipping qualities of concrete roads are appreciated as no calks are allowed on the horses' shoes.
In the Center—The mixer starting work on the new road. A delegation of officials who arrived to watch the job begun may be seen at the right.
Below—A typical section of the demonstration road along the banks of the Seine which is at the left.

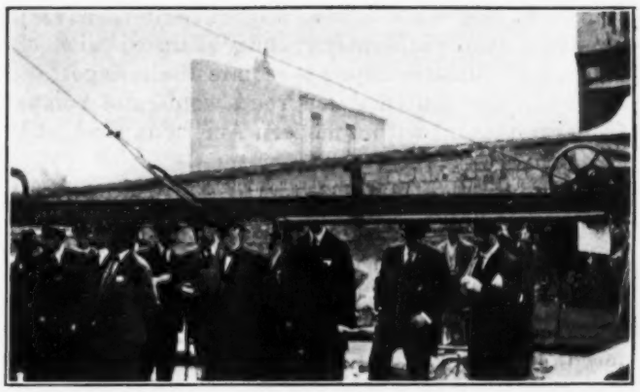
cracks which are evident have occurred along these planes. The extremes of temperature are not as pronounced as in the States, and it was decided not to endeavor to control the cracks by the use of ex-

A TRUCK LOADED WITH RED WINE TRIES THE NEW CONCRETE ROAD.

pansion joints but to fill them with bitumen as they occur.

The aggregate was a carefully selected washed sand and gravel, the maximum coarse aggregate being 1½ in. A mix of approximately 1 : 2 : 3 was used. The cement was a standard Portland cement from several different manufacturers, members of the association, a careful record being kept of the brands and the conditions under which employed. Wetting down was continued for a period of ten days after pouring, the concrete being covered with canvas while setting.

The cement arrived by scow and was unloaded into a warehouse situated about the center of the work,



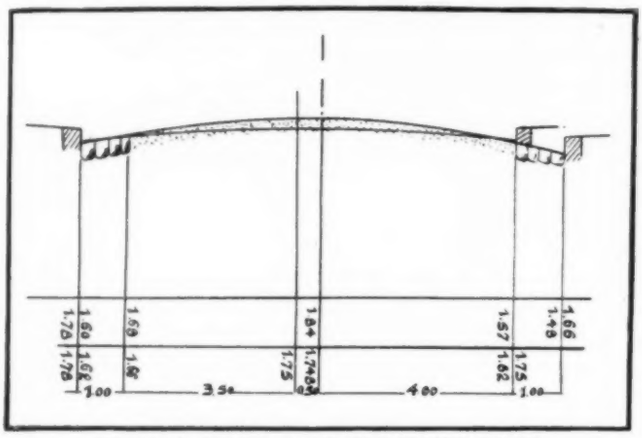
THE PREFET DE LA SEINE WITH HIS ENGINEERS VISITING THE JOB.

from where it was trucked to movable cement platforms located at the mixer. Sand and gravel arrived by scows and was unloaded with clamshells to storage piles, from where it was shovelled by hand to V-type dump cars of ½-yd. capacity, suitably partitioned for the proper proportions of sand and gravel. A mechanical loader would have been ideal for this part of the work.

The cars were hauled to the mixer by gasoline locomotives. A movable turntable located directly opposite the mixer permitted the cars to be turned and dumped directly into the loading skip. It was endeavored to have the mixing period established at 1¼ min., but sufficient attention was not given to this feature. Likewise the water content varied considerably and unnecessarily. Wetting down was not as rigorous as desired nor was sufficient care exercised in the finishing. These requirements for a satisfactory concrete road were insisted on by the engineers in

THIS PHOTOGRAPH SHOWS CLEARLY THE GENERAL CONSISTENCY OF THE MIX.

charge of the work, but it was difficult to have the laborers, who were entirely unacquainted with concrete road construction, appreciate their importance. Although the contemplated road would not compare from every point with a modern American road, at the same time, the great care in selecting materials and the construction of the road in general, combined with the use of the finishing machine has produced a road the inherent good qualities of which will become more apparent each day.



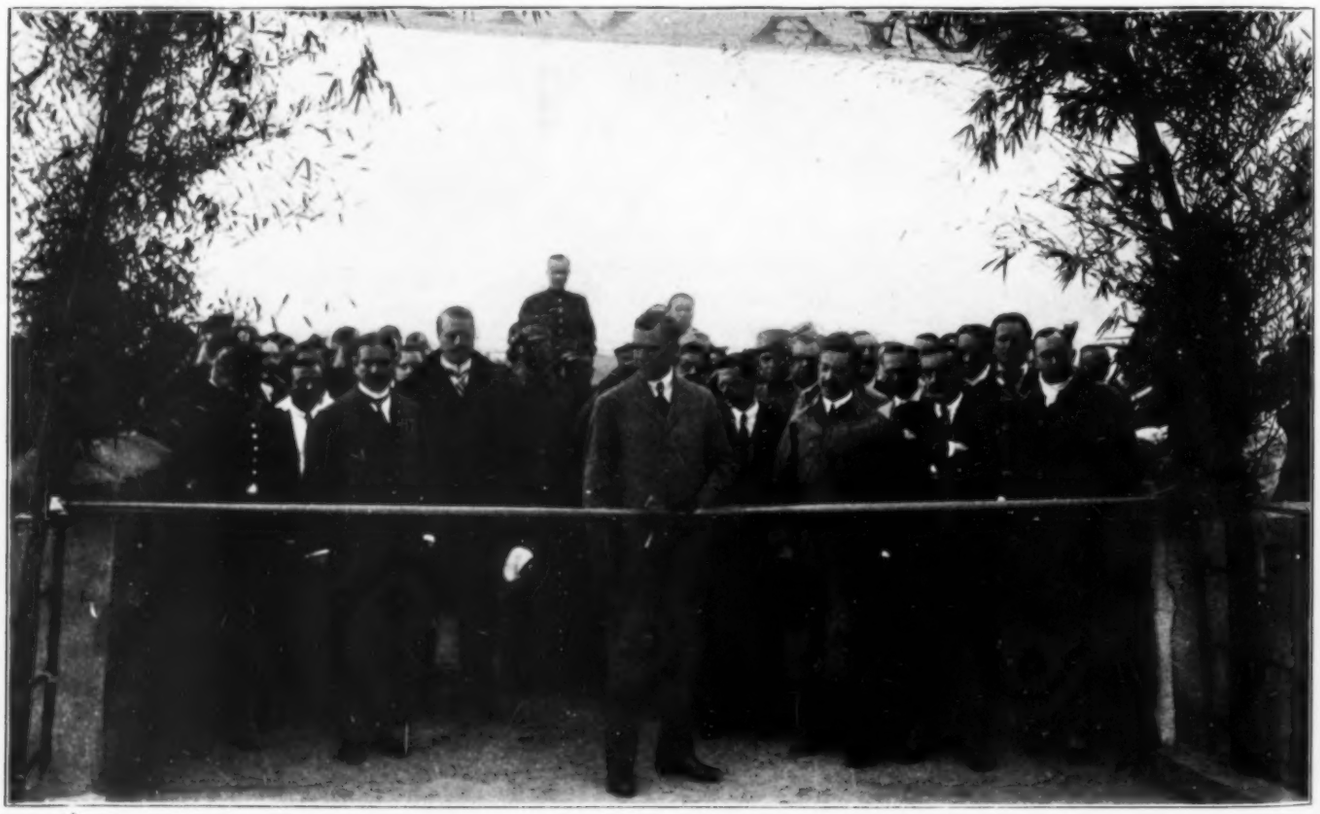
TYPICAL SECTION OF CONCRETE ROAD.

At street intersections and areaways serving industries, "ciment fondu," or electric cement was employed. This cement has a normal setting period but hardens rapidly, which enabled street intersections to be thrown open to traffic in 48 hrs. instead of 28 days, which was generally required. Although the cost of this cement was practically the price of Portland, its use for the purpose mentioned avoided the necessity for temporary planking and the other inconveniences which arise in protecting crossings for the length of time usually necessary.

No difficulty was experienced in constructing the road in two longitudinal strips, other than the inconveniences which were occasioned by the use of wood forms instead of a good steel for the finishing machine. The first half of the road was constructed in the regular way and for the second strip a double-flanged wheel was used on the form at the curb and a flangeless wheel was allowed to ride on the concrete of the first section at the center of the road. An additional man was placed on the finishing machine with a pail of grout, which was fed under the belt at the joint to take care of any slight inequalities which might have been left by the tamper. It was found impractical to pass over the second strip more than once with the finishing machine, but by performing this part of the work exceptionally slowly and carefully a very satisfactory surface was obtained and the finishing machine had no difficulty in keeping up with the paver. No attempt was made to obtain a perfect joint or bond but rather to have a longitudinal plane of weakness in the center.

The work was performed under the authority of Mr. Parmentier, engineer of the Department of the Seine. The Société des Grands Travaux de Marseille had the contract for the construction.

Brazil Opens Its New Roads with Appropriate Ceremonies



THE FIRST FIXED DAM ON THE OHIO

New Structure at Emsworth, Pa., Near Pittsburgh, Built in Two Sections, 977 Feet and 750 Feet in Length

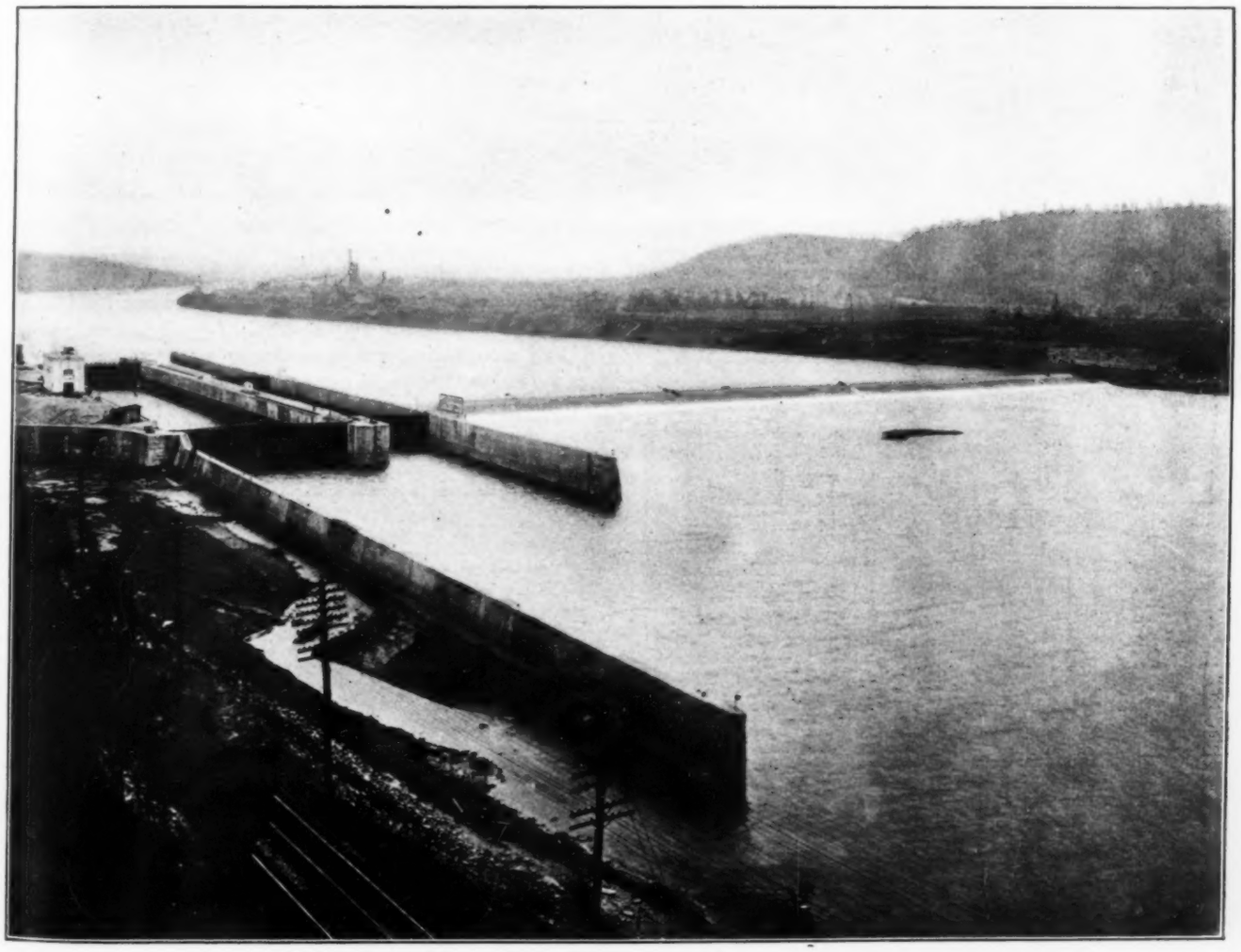
By J. W. Arras, Assistant Engineer

THE Emsworth Dam, an important navigation improvement on the Ohio River at Emsworth, Pa., is located 6 mi. below the head of the river at Pittsburgh. It was built under a three-year contract—August, 1919, to August, 1922—and is the first fixed dam to be constructed in the Ohio, all others being of the movable type. The structure is of concrete throughout except for a shallow crib and round bearing, and steel sheet piles underneath the dam where founded on gravel. The locks and about 110 lin. ft. of dam are on a sandstone foundation. The entire work contains 113,338 cu. yd. of concrete of monolithic construction.

The structure consists of 2 locks and 2 dams, one of the latter—977 ft. long—across the main channel north of Neville Island, and the other—750 ft. long—across the secondary channel south of the island. The larger lock is located at the right bank of the main channel, and has usable dimensions of 110 ft. by 600 ft. with a normal depth of 13 ft. on its sills. The smaller lock, 56 ft. by 360 ft., in its usable dimensions, and having the same sill depth, adjoins the larger lock on its river side. The capacity of the locks is sufficient for all probable future demands of the traffic.

Every part of the structure was constructed within unwatered cofferdam inclosures, built in consecutive sections covering the locks and guide walls, and both dams from bank to bank, with the abutments. At the locks the well-known box cofferdam was adopted and for the dams mostly steel sheet pile and gravel cofferdams were used. Practically all gravel excavation was made by dipper dredges and in making rock excavation the blasted material was removed by drag line scraper or in dump cars loaded by steam shovel. Save when the cofferdams were flooded, operations were conducted without intermission during summer and winter.

The primary object in constructing this dam was to provide the great industrial center at Pittsburgh with a permanent harbor for mooring, trans-shipping and



A GENERAL VIEW OF THE DOUBLE LOCK AND MAIN CHANNEL OF THE EMSWORTH DAM

A SECTION OF THE EMSWORTH DAM, SHOWING TYPE OF CONSTRUCTION

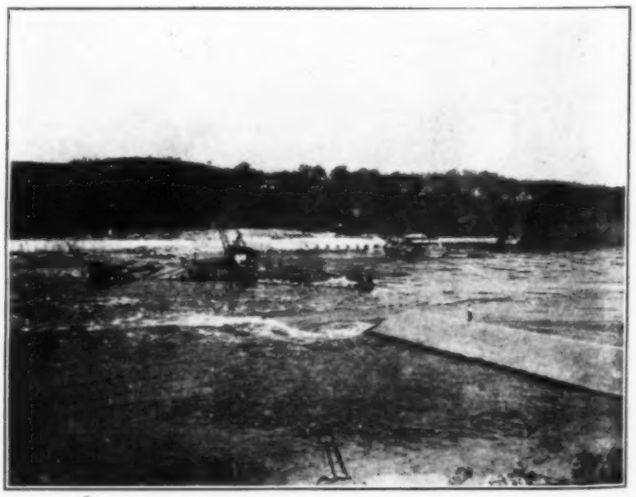
transporting its large and rapidly growing river commerce, and at the same time eliminating two of the oldest Ohio River movable dams needing immediate

THE UP-TO-DATE FLOATING CONCRETE PLANT

extensive repairs and partial costly reconstruction. Incidentally also the Emsworth pool will maintain a more dependable supply of water for condensing and other important uses for the industries at Pittsburgh.

One of the photographs shows a general view of the double lock and main channel dam looking upstream. The lift of the dam above level of pool below is 10.9 ft. and above extreme low water with movable dam No. 3 (below) down is approximately 15 ft.

The view shown in the photograph at the top of this page shows a section of the dam. The principles in-



PART OF THE COFFERDAM SWEPT AWAY BY FLOOD

© Underwood & Underwood

PUTTING THE FINISHING TOUCHES ON THE DAM. THIS VIEW, LOOKING UPSTREAM, SHOWS THE CONCRETE PLANT STILL AT WORK

volved in this section are not new and with certain variations have been pretty thoroughly tested in dams in the rivers of this region during the past thirty years or more. It will be observed that for stability against sliding, overturning, etc., the section is excessive. Its principal characteristic, however, is intended and believed to be an effective prevention of scour along the downstream side tending to undermine the structure. Having a horizontal crest, a slope not exceeding one vertical on three horizontal and at lower pool level and foot of slope a level step or apron not less than 10 or 12 ft. wide, the tendency of this dam is to create below a reacting undertow which carries riverbed materials lying below or that pass over the dam, back to it and deposit them along the lower side.

The latest design of floating concrete plant constructed by The Dravo Contracting Company was used during the latter period of the work. It has a capacity for mixing and placing through a chute of 75 cu. yd. per hour and is capable of delivering concrete at the level of the mixer hull up to 250 ft. from the mixer. It may be seen in two of the photographs.

In September, 1921, the contractor, during a rise, lost a part of the cofferdam with which he had closed the final gap in the dam. As a result of subsequent rises the riverbed in the opening, practically 200 ft. wide, scoured to bedrock, 43 ft. below crest level of dam. To close the gap the downstream half was filled with derrick stone and huge concrete blocks weighing about 12 tons each, while the upstream half was filled with smaller material. An open cribwork in two lengths was placed above the opening, filled with stone, lined with steel sheet piling on the upstream side and bermed with gravel. After constructing a steel pile cofferwall along the lower side of the opening a 5-ft. slab of concrete in water was placed on the fill within. When the concrete was set hard the inclosure was unwatered and the dam constructed thereon. One of the smaller photographs shows the opening with the water 40 ft. deep flowing through.

CRANE ERECTS TRESTLE BENTS

THE erection of framed trestle bents with a locomotive crane is shown in the accompanying photograph, which was taken at the Mitchell Dam at Verbena, Ala. The bents were framed on the bank, and by using the crane they were quickly swung into place at a cost of about 75 per cent of the usual cost and at a great saving of time.

The Mitchell Dam, which is being built for the Alabama Power Company by the Dixie Construction Company of Birmingham, Ala., is on the Coosa River about 60 miles south of Birmingham. It is one of the many hydro-electric power developments now being made in the South and will furnish power for a considerable section of the country. On the actual construction work electrical equipment is used almost exclusively. Bulk cement also is used.

HANDLING HEAVY PIPE

Crane Mounted on Trailer Makes Good Record in Baltimore

THE Baltimore City Water Department has been working during the summer and fall with a crane mounted on a rubber-tired 5-ton trailer, and the results obtained have been so satisfactory that a second crane has been purchased.

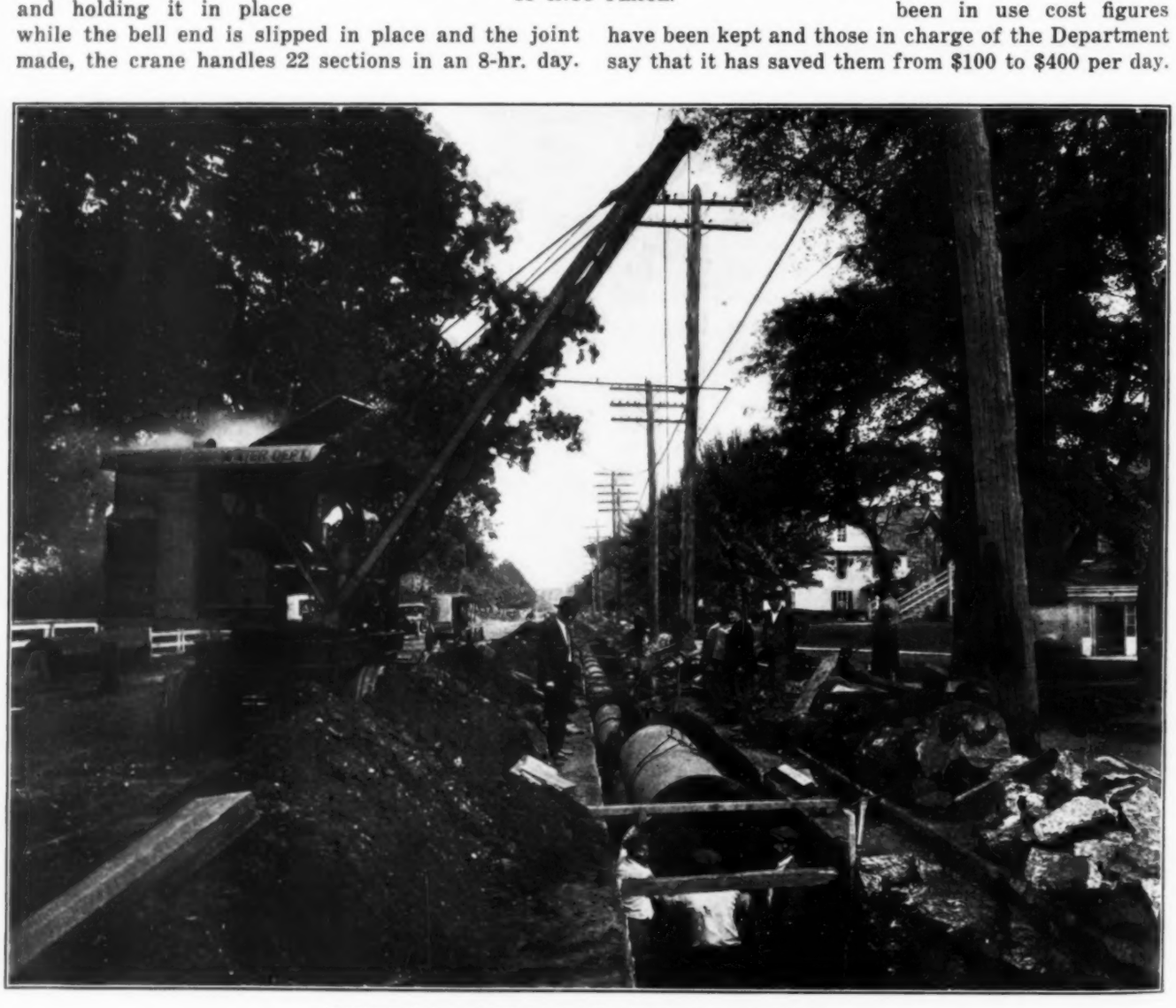
The pipe used on the job illustrated in the photographs is 36-in. in diameter, 12 ft. in length and each section weighs about 5500 lb. The records show that including dragging the pipe across the road, lowering it into the ditch and holding it in place while the bell end is slipped in place and the joint made, the crane handles 22 sections in an 8-hr. day.

SECTION OF PIPE AFTER BEING DRAGGED ACROSS ROAD. CRANE IS ABOUT TO PICK IT UP AND LOWER IT INTO PLACE.

The photographs tell the story even more plainly than words.

In addition to the actual handling of the pipe, the crane has been used for backfilling. The trailer on which it is mounted is equipped with a chain-drive travel mechanism which permits of slow movement when on the job. This mechanism can be detached quickly when it is necessary to move the crane to another job where it is towed by a motor truck.

Since this crane has been in use cost figures have been kept and those in charge of the Department say that it has saved them from $100 to $400 per day.



LOWERING HEAVY SECTION OF PIPE INTO DITCH.

ALL ROADS LEAD TO CHICAGO

Congress Hotel and Coliseum Will Be Objectives of All Good Highwaymen January 15th to 19th

THE record made at the American Good Roads Congress and National Good Roads Show in 1922, when 22,000 delegates and visitors attended, seems certain to be surpassed next month when the 1923 Congress and Show will be held at the Congress Hotel and Coliseum in Chicago. It will be the Thirteenth American Good Roads Congress, the Fourteenth National Good Roads Show and the Twentieth Annual Convention of the American Road Builders' Association.

The Coliseum will be devoted entirely to the show and the sessions of the Congress and Convention will be held at the Congress Hotel. All of the available space in the Coliseum has been reserved by exhibitors and the resulting exhibition of road construction methods and machinery will be the best ever held. The show in the Coliseum will begin Jan. 15 and extend through Jan. 19. The Congress will get under way Jan. 16 and also extend through the 19th.

A program that will be of interest to every contractor and engineer who is interested in the construction and maintenance of roads has been prepared, and all sessions will be open. The complete program follows:

OPENING SESSION

Tuesday Morning, Jan. 16, 10 A. M.

Chairman—Thomas J. Wasser, State Highway Engineer of New Jersey, President, American Road Builders' Association.
President's Address.
Greeting and Inspiration.
James H. MacDonald, Treasurer, American Road Builders' Association.
Continued Highway Expenditures Required to Meet Traffic Demands of the Future.
Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads, Washington, D. C.
Progressive Construction of Highways.
(a) Practice in North Carolina. By C. M. Upham, State Highway Engineer, North Carolina.
(b) Practice in Iowa. By C. Coykendall, Assistant Chief Engineer, Iowa Highway Commission.
The Obligation of the State Highway Department to Keep the Public "Sold" on Highways.
H. E. Hilts, Acting Chief Engineer, Pennsylvania State Highway Department, Harrisburg, Pa.

DESIGN

Tuesday Afternoon, Jan. 16, 2:30 P. M.

Chairman—Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads.
What Test Roads Results Have Taught Us.
(a) Bates Test Road, Clifford Older, State Highway Engineer of Illinois, Springfield, Ill.
(b) Pittsburgh Test Road, Lloyd Aldrich, Consulting Engineer, San Francisco, Cal.
(c) Arlington Tests, A. T. Goldbeck, Engineer of Tests, Bureau of Public Roads, Washington, D. C.
Development of Apparatus for Field Testing of Roads.
H. F. Clemmer, Testing Engineer, Division of Highways, Springfield, Ill.
Developments in the Use of Local Materials.
Vernon M. Pierce, District Engineer, U. S. Bureau of Public Roads, Washington, D. C.
Designed Subgrade.
C. M. Upham, State Highway Engineer, Raleigh, N. C.

CONSTRUCTION

Wednesday Morning, Jan. 17, 10 A. M.

Chairman—J. H. Cranford, President, Cranford Paving Company, Washington, D. C.
Haulage Methods in Highway Construction.
Industrial Railways, A. J. Parrish, General Contractor, Paris, Ill.
Heavy Truck Haulage, Charles H. Fry, Charles H. Fry Construction Co., Erie, Pa.
Light Truck Haulage, A. E. Horst, Henry W. Horst Co., Rock Island, Ill.
How to Equip and Operate Local Gravel Pit to Produce Concrete Aggregate.
H. E. Kuelling, Construction Engineer, Wisconsin Highway Commission, Madison, Wis.
How Much Time Is Lost in Delays in Highway Building?
H. K. Davis, Chief Inspector, Iowa Highway Commission, Ames, Iowa.
Discussion, B. H. Piepmeier, State Highway Engineer of Missouri, Jefferson City.
What Roadbuilding Work Can Be Done in Winter?
John H. Mullen, Chief Engineer, Minnesota Highway Department, St. Paul, Minn.

MAINTENANCE

Thursday Morning, Jan. 18, 10 A. M.

Chairman—A. R. Hirst, State Highway Engineer, Madison, Wis.
Organization of Intensive Maintenance on a State Highway System in Eighteen Months.
Frank Page, Chairman, North Carolina State Highway Commission, Raleigh, N. C.
Four Years Experience With Patrol Maintenance in Wisconsin.
J. T. Donaghey, Maintenance Engineer, Wisconsin Highway Commission, Madison, Wis.
Gravel Road Maintenance Practice in Michigan.
L. H. Nielsen, Deputy State Highway Commissioner of Michigan, Lansing, Mich.
Blade Grader and Road Drag Earth-Road Maintenance in Iowa.
W. H. Root, Maintenance Engineer, Iowa State Highway Commission, Ames, Iowa.
Salvaging and Maintenance Macadam Roads.
W. A. Van Duzer, Assistant Maintenance Engineer, Pennsylvaia Highway Commission, Harrisburg, Pa.
Discussion, A. W. Muir, Superintendent of Maintenance, New Jersey Highway Commission, Trenton, N. J.

TRAFFIC

Thursday Afternoon, Jan. 18, 2:30 P. M.

Chairman—Thomas J. Wasser, State Highway Engineer, New Jersey.
Tourist Traffic as a Factor in Highway Development (Illustrated).
A. R. Hirst, State Highway Engineer of Wisconsin, Madison, Wis.
Changes Needed in Motor Vehicle Legislation and License Fees.
J. N. Mackall, Commissioner of Roads, Baltimore, Md.
Discussion, Leon C. Herrick, Director of Highways and Public Works, Columbus, Ohio.
Harry Meixell, Jr., New York, National Automobile Chamber of Commerce.
Election of Officers.
Business Meeting.

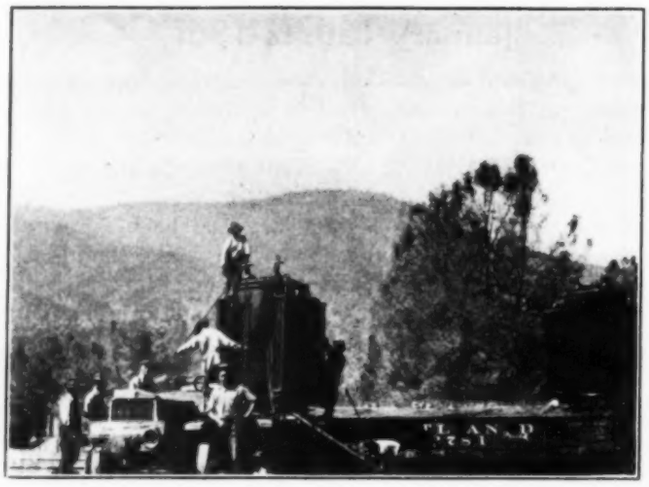
FINANCE AND MISCELLANEOUS

Friday Morning, Jan. 19, 10 A. M.

Chairman—Frank Page, Highway Commissioner of North Carolina.
Have Large Expenditures Changed the Public Attitude Toward Highway Development?
S. E. Bradt, Former Superintendent of Highways of Illinois.
Co-operation Between State and County Highway Department.
L. C. Herrick, Director of Highways and Public Works, Columbus, Ohio.
How Individual Organizations Can Fit Their Work Into the Broad Highway Research Program.
W. K. Hatt, Director Highway Research Committee, National Research Council, Washington, D. C.

TRUCKS HANDLE BIG TRANSFORMERS

HEAVY-DUTY trucks are often called upon to handle jobs which were never intended for them. One of the ten trucks on the San Francisco Hetch-Hetchy project has successfully performed such a feat. At Moccasin Creek, three large transformers, weighing 10½ tons each, were moved over an 8 per cent grade by this truck, which had another record to its credit. In the 14 months it has been on the job it has never been necessary to drop the crank case. It required a half day to set the rigging up for moving the transformers and 4 hr. to load, transport ½ mile, and unload. A performance like this in such rugged country shows that a well constructed motor truck can tackle some pretty big problems. The speed with which it can do its work means money saved for the contractor.



HOLDING DOWN A BRIDGE

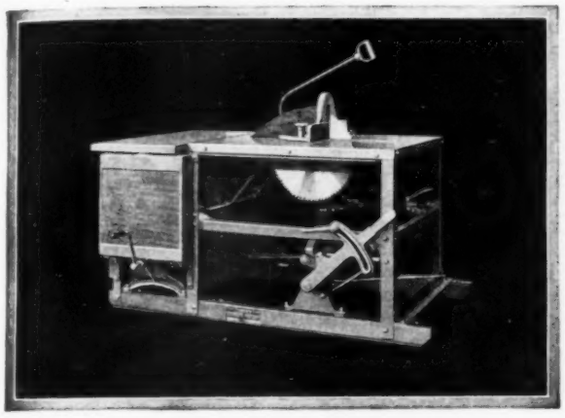
By Ivan E. Houk, City Engineer, Dayton, Ohio.

ALONG the streams in southwestern Ohio are many old-fashioned covered wooden bridges—some of them from fifty to seventy-five years old. As a general rule these bridges were as substantially built as those of more modern construction. The wooden superstructures were set on stone piers built well above the crest elevations of the highest floods and carried well below the beds of the rivers. In the disastrous flood of March, 1913, the wooden bridges in the Miami Valley stood up as well if not better than the steel bridges. However, the construction of the flood prevention dams by the Miami Conservancy District made it necessary to anchor some of the wooden bridges above the dams to their foundations so as to prevent their floating away when the basins become filled with water. In other words it became necessary to hold the bridges down as well as up. During ordinary floods the backwater rises well above the floors of some of the bridges, while in unusual instances it may rise 30 or 40 ft. above their tops.

The accompanying photographs show how the superstructures are tied to the foundations. Iron rods, 1¼ in. in diameter, with an eye on the bottom and threads on the top, pass vertically between the timbers of each truss, one each side of each pier and at each abutment. The upper end of the rod passes through the heavy timber which constitutes the upper chord, thence through a heavy iron plate or washer laid on top of the chord, over which a large nut is screwed on to the rod. The eye at the lower end is tied to the foundation by 4 steel cables which are attached to iron bolts firmly set in the masonry about 1 ft. apart and about 12 ft. below the superstructure.

Sidewise motion of the superstructure is prevented by the rods passing between the truss timbers; the lower chords, end posts, and diagonal bracing each being made up of two or more timbers a few inches apart. By the time the water rises to the elevation of the bridge floor the backwater effect has cut down the velocity so that there is no appreciable force tending to sweep the superstructure downstream. During the flood of last April the backwater stood nearly at the top of the bridge shown in the photographs, as indicated by the highwater mark on the right side of the bridge in the lower picture, without causing any damage whatever to the superstructure.

C H & E OUTFITS



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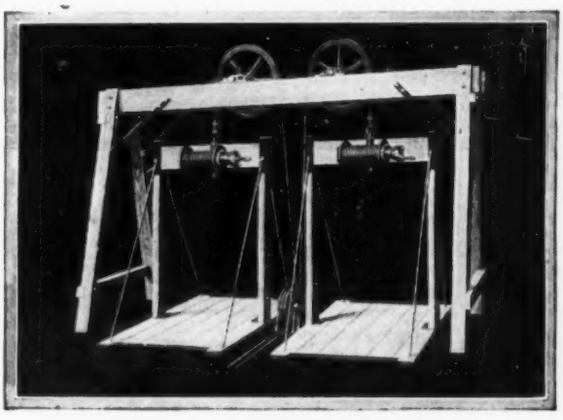
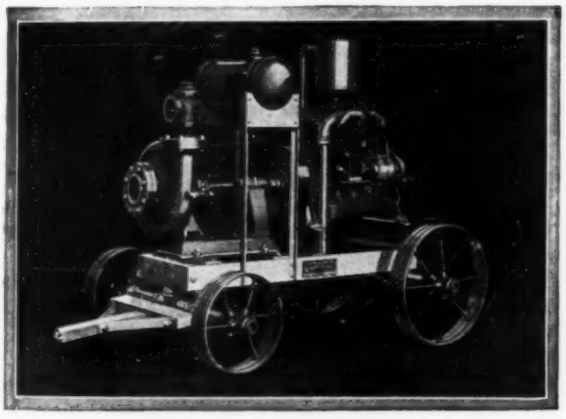
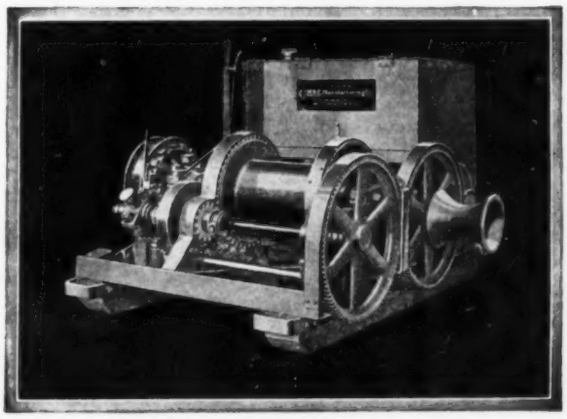


C. H. & E. MATERIAL ELEVATOR



C. H. & E. NO. 10 CENTRIFUGAL PUMP



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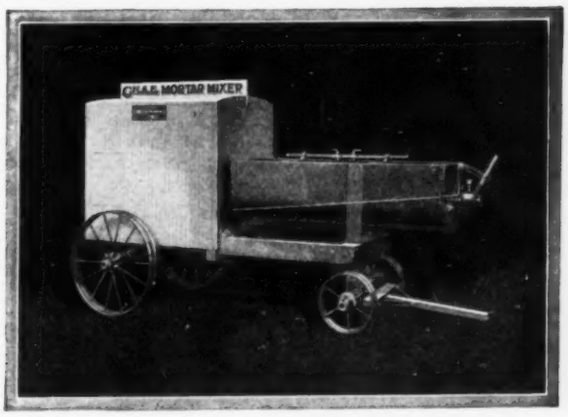

C. H. & E. NO. 3 MORTAR MIXER

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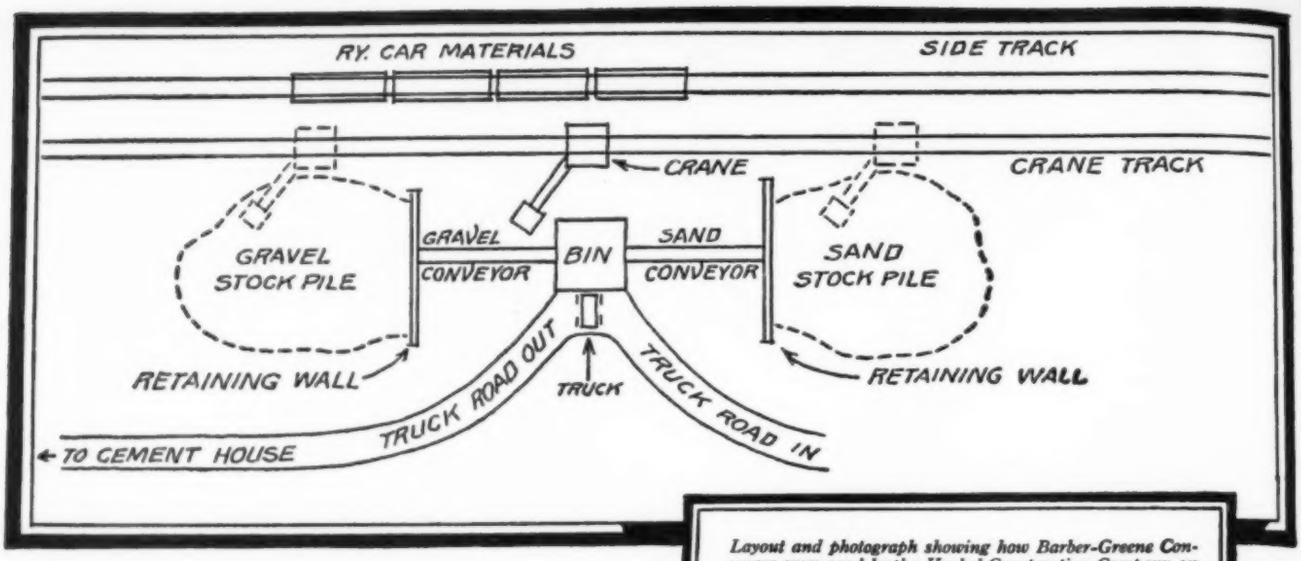


Layout and photograph showing how Barber-Greene Conveyors were used by the Henkel Construction Company on the North Iowa Pike.

How Barber-Greene Conveyors Worked on the North Iowa Pike

Laying 5 miles of 18 foot road in record time by employing efficient material-handling methods

On a section of the North Iowa Pike, between Hutchins and the Kossuth County Line, the Henkel Construction Company of Mason City had an average sand and gravel haul of two and a half miles to the mixer. Fifteen trucks were operated,

To make sure of efficient handling they used the layout shown above.

The two Barber-Greene Conveyors were used to reclaim from the stock piles. Each one was served by one operator and two helpers

Other contractors also use Barber-Greene Conveyors in place of cranes for unloading from cars.

On the Rome-Morgan road in Ohio last year, E. J. Inman of Ashtabula found that a 3/4-ton yard crane could unload a maximum of only six cars a day into bins. Its daily average was only four cars.

At the time it didn't seem likely to him that equipment costing much less to buy and operate could do twice as much.

It was demonstrated, however, that a Barber-Greene Portable Conveyor on the same job could unload as many as twelve cars into bins, and average ten.

This year he has found that he can do without the bins.

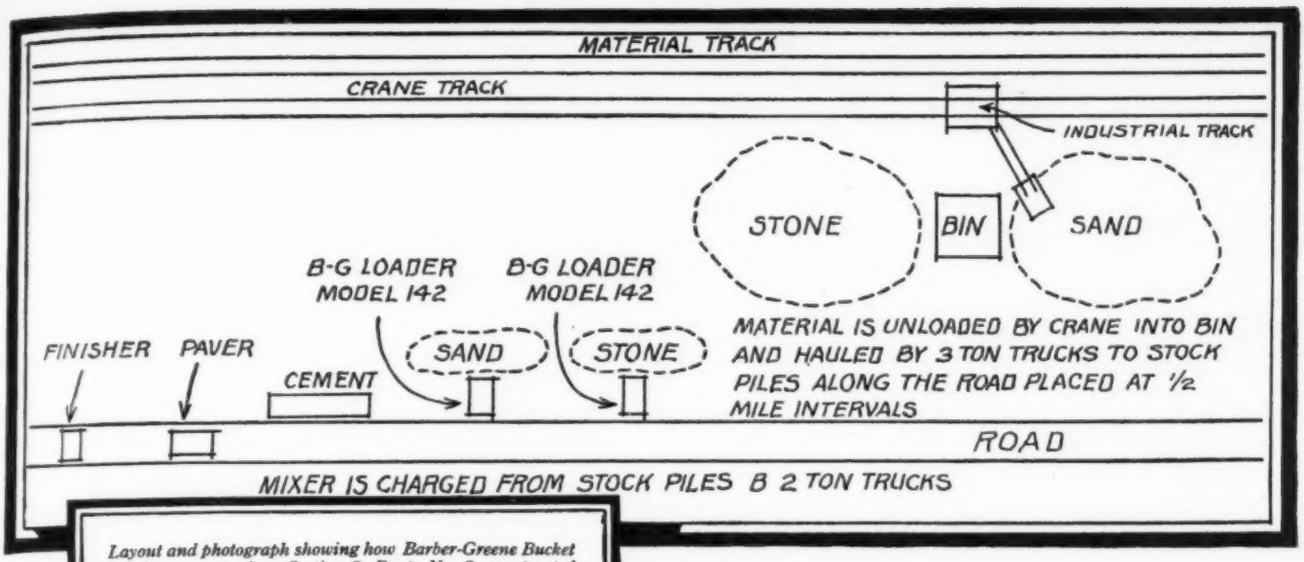
He unloads a five-ton truck directly from the car in one and a half minutes. Without making a new set-up he pivots the Barber-Greene to unload on two stock piles.

By changing the set-up he reclaims from the stock pile with the Barber-Greene.

Other ways of using Barber-Greene Conveyors to cut costs and speed handling are described in our free book "Results on Road Jobs."

BARBER-GREENE COMPANY
530 W. Park Avenue, Aurora, Illinois
Branch Offices in 33 Cities

BARBER-GREENE
PORTABLE BELT CONVEYORS



Layout and photograph showing how Barber-Greene Bucket Loaders were used on Section 2, Route No. 2, constructed by the Highway Division of the State of Illinois.

How Illinois Uses Four Men and Two Barber-Greenes

Four men replace a crew of 16 and do all the stone, sand and cement loading for rock stock-piles

On Section 11 of Route No. 2, constructed by the Highway Division of the State of Illinois, a Barber-Greene Stone Loader has replaced seven men and a Barber-Greene Sand Loader has replaced five.

Where sixteen men of the crew used to be required for loading trucks from stock piles, only four are required now. And even these four are not busy all the time because the Barber-Greenes work faster then the seven two-ton trucks.

Many other state highway districts and counties are finding that they can cut down their day-labor costs appreciably by using Barber-Greene Loaders. That is why more and more Loaders have replaced shovelers at the sand and gravel piles in many counties.

Below is a partial list of states, counties and municipalities that have purchased Barber-Greene Loaders.

Pinal County, Arizona; State of California; Gov. of Vancouver; Municipality of South Vancouver; Toronto Transportation Commission; Canadian National Park; Conejos County, Colo.; Pueblo County, Colo.; City of Colorado Springs; State of Colorado; City of Denver; Chatham County, Ga.; Burley Highway District; Idaho; Macon County, Ill.; DeKalb County, Ill.; State of Illinois; Hendricks County, Indiana; Tippecanoe County, Indiana; City of Fort Wayne, Indiana; City of Old Town, Me.; Town of Orange; City of Detroit; City of Grand Haven; St. Louis County, Mo.; Cortland County, N. Y.; State of N. Y.; Trumbull County, Ohio; Washington County, Pa; Salt Lake City; Salt Lake County; City of Laconia, N. H.; Snohomish County, Wash.; County of Cowlitz; Hickman County, Tenn.; Ashland County, Wis.; Milwaukee County, Wis.; Richland County, Wis.; Washington County, Wis.

Other ways in which Barber-Greenes are used on 24 typical road jobs are described in "Results on Road Jobs." Send the coupon for it.

BARBER-GREENE COMPANY
530 W. Park Avenue, Aurora, Illinois
Branch Offices in 33 Cities

Send this Coupon

BARBER-GREENE COMPANY,
530 W. Park Avenue, Aurora, Ill.
Please send me "Results On Road Jobs". (No obligation.)
Name _____
Company _____
Address _____

BARBER-GREENE
SELF-FEEDING BUCKET LOADERS

The Thew Continuous Tread

The Thew Shovel has been traveling on continuous tread for more than four years, long enough to prove right design and proper construction.

Power Steer

A slight swing of the cab to right or left disengages the clutch of either tread. The machine will actually turn around in its own length.

Two Speeds

The Type O travels 65 ft. a minute on level ground; 42 ft. a minute on sharp grades or in heavy going.

Climbs Stiff Grades

It has been known to take a 40% grade under its own power.

Gives Ample Bearing

Treads are 26″ wide (9′2″ over all) and 9′4″ long. The shovel has ample bearing surface and stability without interference with close digging over either end.

Double Sprockets and Rollers

Has double sprockets for driving the treads, and double rollers to increase stability. Treads can not ride off sprockets on side hill work.

Is Flexible

The rocker bearing block turns with the up and down motion of either end of the front axle which is attached to the truck frame by a swivel pin. Four point suspension for digging is given by adjustable wedges.

Is Ruggedly Built

Like the traction truck it is built with the semi steel center having single I beams for tread clearance. The truck frame, side members, sprockets, chains, gears and clutches are all built in keeping with the heavy duty the shovel performs.

THE THEW SHOVEL CO., LORAIN, OHIO

30 Church St.
NEW YORK CITY

Monadnock Block
CHICAGO

Railway Exchange Bldg.
KANSAS CITY, MO.

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WIRE ROPE

Do You Still Accept This Uncertain Evidence?

Or will you insist upon "WILLIAMSPORT" with the positive protection their "Telfax" patented Tape Marker assures

SINCE the introduction of the patented Telfax Tape in Wire Rope [which distinguishes each grade from the other], "Williamsport" has become the *preferred* Rope on thousands of operations where protection against accidents is the paramount thought among executives.

The use of Williamsport Telfax marked wire rope indicates that operators are endeavoring to raise their standard of safety in the use of wire rope, because of the positive, unmistakable assurance of its grade.

Why take a chance with any wire rope which does not give you this direct factory protection?

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WILLIAMSPORT WIRE ROPE CO.

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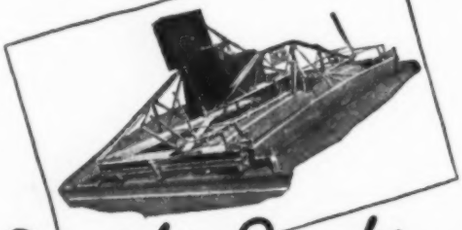
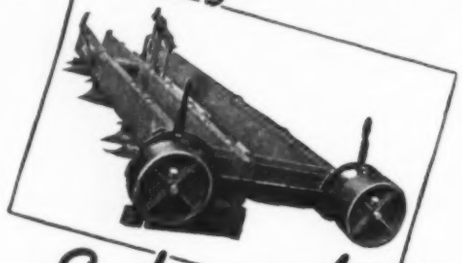
"The Fastest Growing Wire Rope Plant in America"

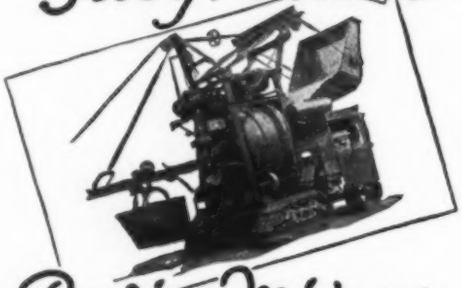
Batch Boxes, Cars and Road Track



Finishing Machines

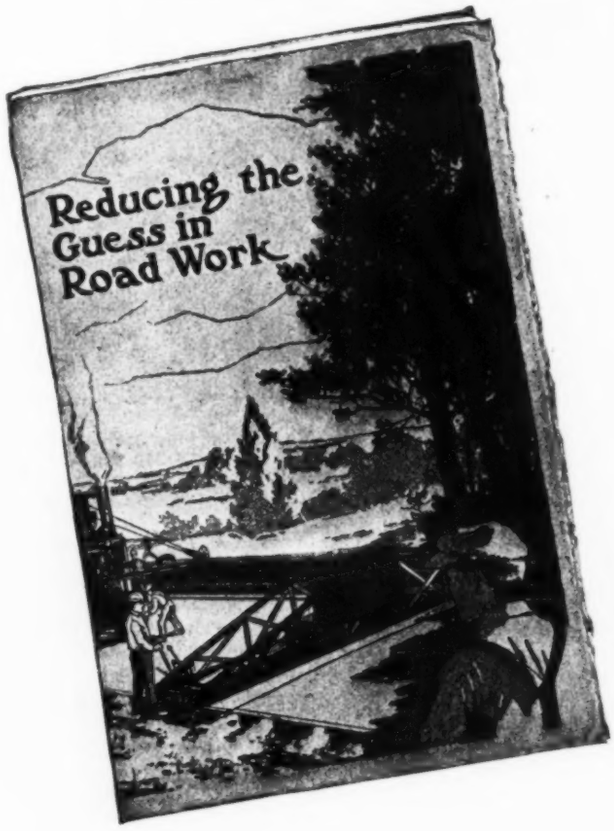


Subgraders



Paving Mixers

Clam Shells



Send for a copy of this book

It describes practical methods of handling road construction which minimize "contingencies."

The data on which it is based are the results of the operation of upwards of three hundred road plants, either complete narrow-gauge haul or combination car and truck haul, which The Lakewood Engineering Company has supplied during the past three years.

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The Lakewood Engineering Co.
Cleveland, U. S. A.

Complete Construction Plant, Concrete Mixers, Steel Towers, Chuting Plants, Elevator Buckets, Tower Hoppers, Concrete Carts, Clam Shell Buckets, Gasoline Locomotives, Cars and Track

ALMACO — EXPORT DEPARTMENT — ALLIED MACHINERY COMPANY OF AMERICA — ALMACO

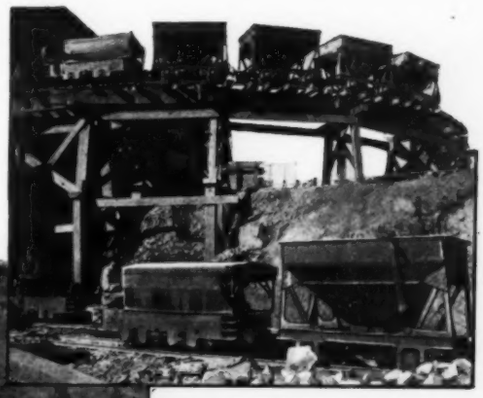
Big Dam Being Built By Roller Bearings

Locomotives, cars and concrete mixers equipped with Hyatt bearings are speeding up construction of Don Pedro Dam and lowering the cost per yard

The correct, continuous, dependable mixing of concrete, the quick transportation of it to the forms without delays, are necessary for the proper building of this great Don Pedro Dam.

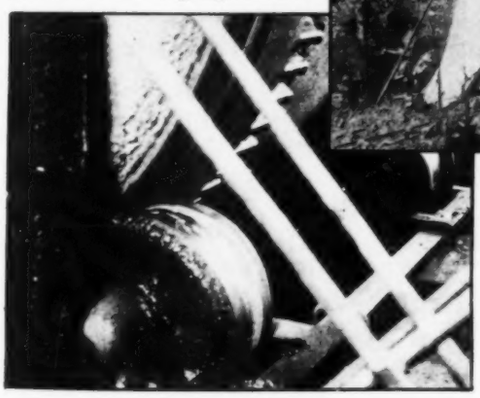
In helping to secure these fundamentals of good dam construction, Hyatt roller bearings in mixers, locomotives and cars are proving their ability to cut costs by eliminating delays for repairs and adjustments.

The Hyatt bearings at this dam are capable of giving their dependable, economical service throughout the life of the equipment,



Hyatt equipped Plymouth locomotives, built by Fate-Root-Heath Company, are hauling concrete in Hyatt bearing cars made by the Joshua Hendy Iron Works.

The great Don Pedro Dam, Turlock Irrigation District, Cal. North end in August 1922.

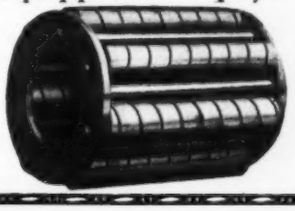


One of Norris K. Davis concrete mixers operating dependably on Hyatt bearings, immune from the effects of cement, dust and water.

and are therefore important factors in the correct and profitable completion of the work.

Briefly, these roller bearings are valuable parts of contractors' equipment because of their ability to roll easily without deterioration under the severest conditions of service—exposed to the elements, to the devastating action of cement, and given only a minimum of attention. One greasing a season is all the attention they require.

Specify that your locomotives, cars and mixers be "Hyatt equipped" it pays.



Hyatt Roller Bearing Co., New York, N. Y.
Industrial Bearings Division

Motor Bearings Division, Detroit
Tractor Bearings Division, Chicago
Pacific Coast Division
San Francisco

Handling a Big Job

Ability to execute economically and promptly the larger development projects is the leading requisite today in the distribution of construction contracts.

The building of the new McDougall Terminal Co. plant at Duluth which is the initial link in a gigantic Great Lakes-Erie Canal-HudsonRiver transportation plan, went to Jacobson Bros., Duluth contractors, largely on account of their ability to execute big contracts in minimum time.

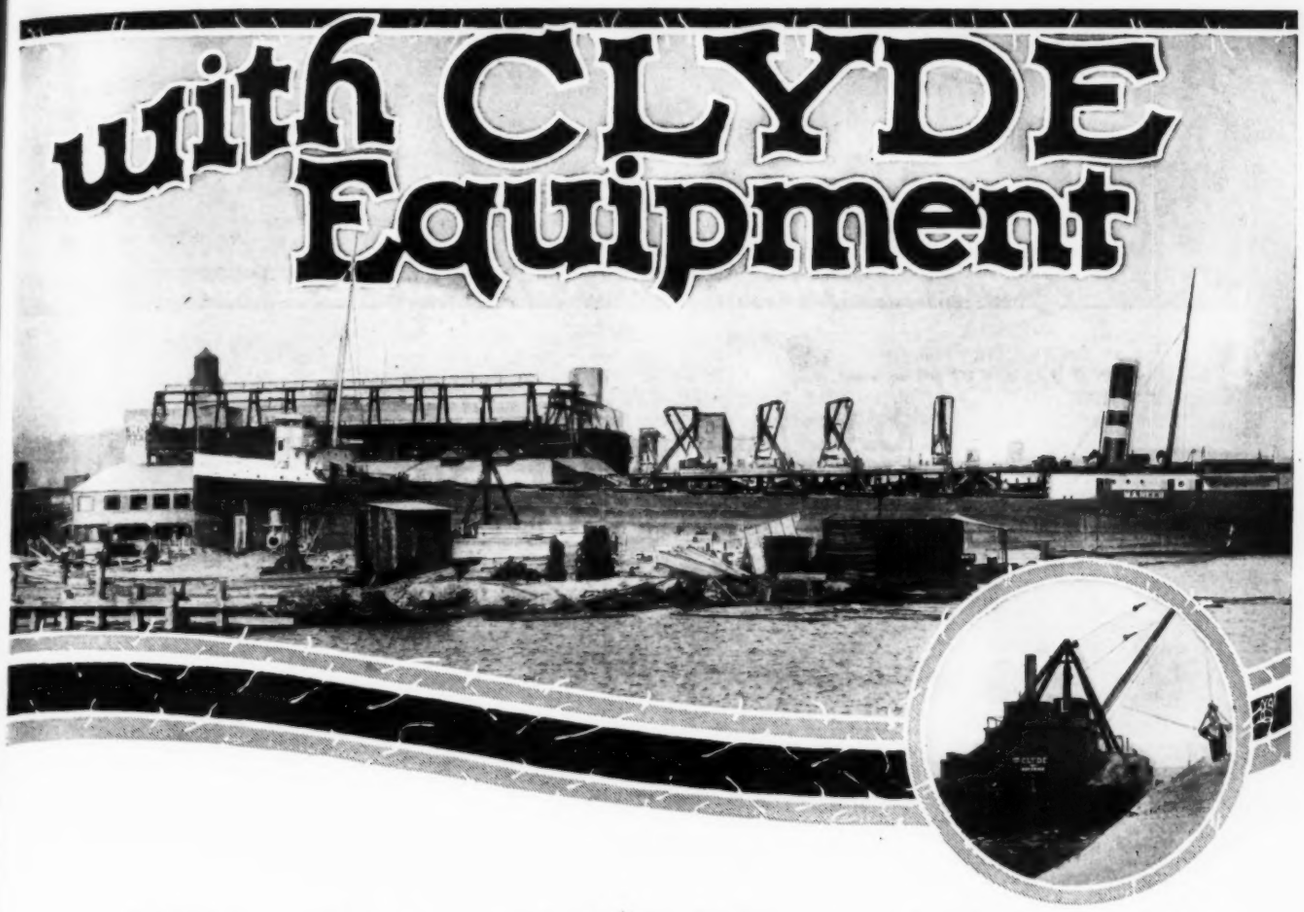
The panorama above shows the work in its preliminary stages. Jacobson Bros. have selected their necessary equipment largely from the Clyde line.

The hoist shed houses a Clyde three-drum steam hoist. Immediately in front of this is a Clyde swinging engine. Next is a standard Clyde Steel derrick. To the right of the tower and operating the concrete bucket is a Clyde Standard two-drum steam hoist. Still farther to the right is a pile driver operated by a Standard Clyde two-drum steam pile driver hoist.

CLYDE

THE CLYDE LINE

Steam Hoists *Electric Hoists* *Gasoline Hoists* *Belt Hoists* *Derrick Fittings*
Steel Derricks *Excavators* *Traction Cranes* *Blocks and Sheaves* *Logging Machinery*



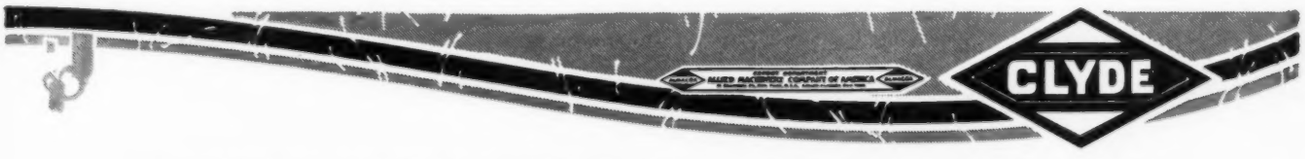
The inserts show barges, both of which are on the Terminal job. The derricks on these barges are handled by three-drum Clyde Engines.

Dependable equipment is essential for continuous, economical construction. That Jacobson Bros. have proven to their own satisfaction the merits of Clyde hoists and derricks is evidenced by the repeat orders which they have placed.

Built primarily to stand wear and tear of logging operations, Clyde Hoists are necessarily constructed of better and heavier materials. Each one will more than meet its rated load capacity. Each one will give a maximum service at a minimum operating cost.

That you may be able to analyze the merits of Clyde equipment, bulletins have been prepared on each unit of the line. From these you may obtain very complete information. They will be mailed you from the home office or any branch.

You'll take pride in your Clyde!



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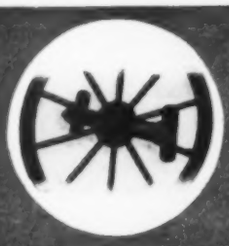
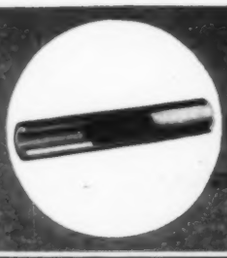
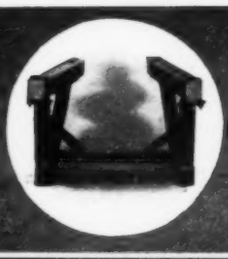


10 Spoke Wheel



Self Lubricating Bearings



Sq. Foot Channel Legs

Sterling Wheelbarrows And Carts Are Better Because

In Design—

LOAD WELL OVER WHEEL
PROPERLY BALANCED
CORRECT DESIGN OF TRAYS
INTERCHANGEABLE PARTS
ACCURATE CAPACITIES
SELF-LUBRICATING WHEELS

All Of Which Means More Materials Handled Per Man Per Day, Better Satisfied Labor, Lower Repair Costs Less Grief, and A Satisfied Customer

Catalogue 35 Tells The Sterling Story

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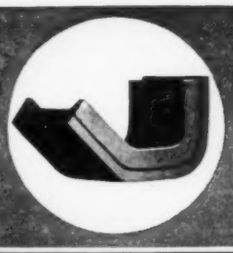
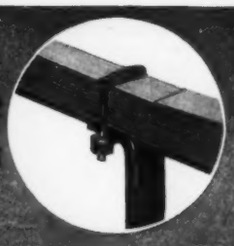
Rolled Steel Keyed Axles

Square Leg Shoes



Handle Clamps



Of These Improvements Which Are Exclusively Sterling

—In Construction

RIVETED LEG CONSTRUCTION
10 SPOKE WHEEL
DOUBLE CORNERED TRAYS
MALLEABLE WHEEL GUARDS
METAL HANDLE TIPS
HANDLE CLAMPS

Which Means You Buy Less Often
You Lose Less Time For Repairs
You Have Less Sudden Breakdowns
You Get Your Materials Placed On Time

A Wheelbarrow Or Cart For Every Service

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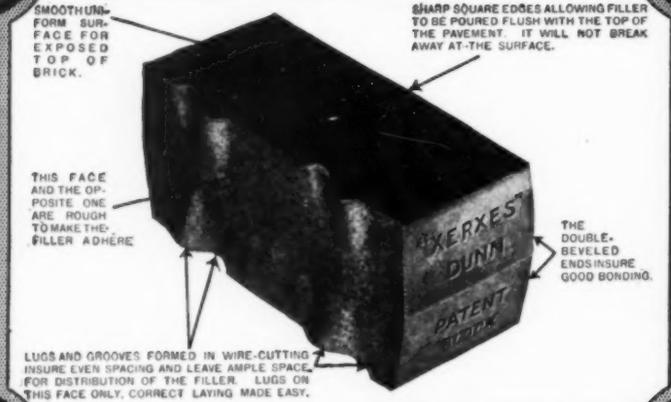
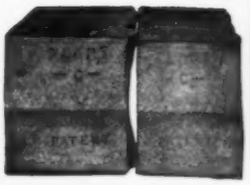
WIRE-CUT LUG BRICK

A Wire-Cut Lug Hillside Brick


SMOOTH UNIFORM SURFACE FOR EXPOSED TOP OF BRICK.
SHARP SQUARE EDGES ALLOWING FILLER TO BE POURED FLUSH WITH THE TOP OF THE PAVEMENT. IT WILL NOT BREAK AWAY AT THE SURFACE.
THIS FACE AND THE OPPOSITE ONE ARE ROUGH TO MAKE THE FILLER ADHERE
THE DOUBLE BEVELED ENDS INSURE GOOD BONDING.
XERXES DUNN PATENT
LUGS AND GROOVES FORMED IN WIRE-CUTTING INSURE EVEN SPACING AND LEAVE AMPLE SPACE FOR DISTRIBUTION OF THE FILLER. LUGS ON THIS FACE ONLY. CORRECT LAYING MADE EASY.



End View—Two Wire-Cut Lug Brick—Note joint spacing

ONE BILLION SIXTY-FOUR MILLION NOW IN SERVICE

IN STREETS AND HIGHWAYS THROUGHOUT THE UNITED STATES AND CANADA

Scientifically designed to meet the requirements of exacting engineers.

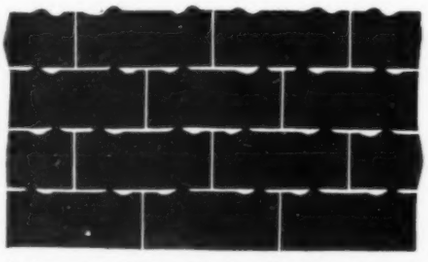
Costs no more per square yard than ordinary brick.

Made in all standard sizes by reputable and progressive manufacturers everywhere.

THE SOUTHERN CONSTRUCTION CO. CHATTANOOGA, TENN.

SAYS:

"WE have laid several millions of wire-cut lug bricks and have a high opinion of them. Our experience has demonstrated that it is possible to get a better bond, a more even surface and a stronger pavement with wire-cut lug brick than with other brick."



Alignment of Wire-Cut Lug Brick in Courses, Showing Uniform Spacing for Filler.

Uniform spacing requires wire-cut lug brick. This is imperative with either bituminous or cement filler.

A wire-cut lug brick pavement is the pride of its builder.

Ask for list of competing manufacturers in your territory.

THE DUNN WIRE-CUT LUG BRICK CO.

LICENSORS CONNEAUT, O.

The Winter Shovel

The Thew gasoline is the winter shovel.

It is just the shovel for those odd jobs that you can pick up this time of year to help keep down your overhead.

It has the same range and flexibility as the Thew steam shovel. Except for gearing to a single source of power it is identical in design and construction.

Of course the continuous tread truck has real power steer and two speeds. The steering is done from the cab.

With the gasoline you will save on fuel and maintenance cost. You won't have to have a night watchman and a fireman. The shovel is always ready for work and easy to run. With the Thew enclosed house, running even in zero weather is not uncomfortable.

The Ambler Davis Company of Philadelphia own this winter shovel. Get their opinion of it.

Or write for your copy of Bulletin 601.

THE THEW SHOVEL COMPANY
LORAIN, OHIO

Thew
Power Shovels

Rock Hauling by Westerns

Loading Western 5-yd. Dump Cars with Rock on Montreal Mine Spur Project.

Here are some of the Rocks Handled by the 5-yd. Western Dump Cars.

Western

That's Why

THE CONTRACTORS found no trouble handling the 25,000 cubic yards of rock on their Montreal Mine Spur project with Western 5-yd. Dump Cars. Many of the rocks were more than a yard long but the dump cars took care of everything that would go through the 2½-yd. dipper.

Wherever Western Cars have been used, our 5-yd. and 4-yd. dump cars, especially the heavy duty cars built principally for rock handling, have established a reputation which easily puts them in the lead as the greatest narrow gauge cars ever built.

Their steep dumping angle, automatic side doors with pivoted door arms and braces, and their unequalled loose hinge construction combined with their wonderful strength and long life, make the Western Dump Cars as near perfection as it is humanly possible to build them.

Western Dump Cars are built in all practical sizes, from 1 cubic yard to 45 cubic yard capacity.

For a detailed description of the Western Cars, send for Catalog S-51.

Western Wheeled Scraper Co.

Earth and Stone Handling Equipment

AURORA, ILL.

Continuous Crushing

A distinguishing feature of the Western-Aurora Crusher is its continuous double-stroke motion, which has the three-fold effect of increasing production, reducing vibration, and requiring less power for operation.

This feature is of itself enough to account for the remarkable efficiency of a Western plant, but there are several others of almost equal importance—all described in Catalog 44-X. Have you your copy yet?

CLEANER STREETS FOR LESS MONEY

That, in a nutshell, is what the Austin Motor Pick-Up Sweeper gives. It sweeps—cleaner than any other method and clear up to the curbs—picks up the sweepings, and then carries them to a final disposal station; effecting material savings of time, labor and expense.

These statements are fully borne out by investigations conducted in several cities by impartial, expert observers.

Certified copies of their reports will be gladly mailed to interested officials.

The Austin-Western Road Machinery Co.

400 North Michigan Boulevard, Chicago, Illinois

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"EVERYTHING FROM A DRAG SCRAPER TO A ROAD ROLLER"

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At each address there are located engineers capable of advising in regard to the most modern American construction and material-handling methods and machinery.

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